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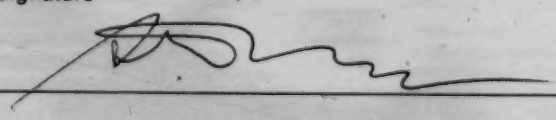

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The Interactive Relationships of Perceived Teacher Directiveness and Student Personological Variables to Grades and Satisfaction

by

© Stewart J. H. McCann

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH

IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE

OF Doctor of Philosophy

Department of Educational Psychology

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Date....May..13,..1982.....

Dedication

Dedicated to all that has been constant in my life,

my mother.

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Abstract

Past research suggested that student authoritarianism, dogmatism, intelligence, convergent-divergent abilities, conceptual level, anxiety, compulsivity, achievement motivation, achievement orientation, locus of control, independence-dependence, and extraversion-introversion interact with perceived teacher directiveness in relation to grades and satisfaction. Prior evidence of moderate intercorrelation among most of the student personological variables suggested that some of the interactive relationships which had surfaced may not be independent. The present study was initiated to simplify the multivariate nature of these interactive patterns by carrying out a modified free stepwise regression analysis of the 12 interactions which could result in a lesser number of nonredundant interactions emerging, weighted according to how much unique variance they could account for in grades and satisfaction. Data were collected from 445 students in the classes of 26 Grade 11 and 12 English teachers at five high schools in regard to English grades and satisfaction with the teacher and the course, the 12 student personologial variables, and the perceived level of teacher directiveness. With a common data base (N = 214), only student achievement motivation interacted at a statistically significant level with perceived teacher directiveness in relation to grades and satisfaction. Students with high achievement motivation attained higher grades and reported

greater satisfaction when the teacher was perceived to be more nondirective, while students with low achievement motivation attained higher grades and reported greater satisfaction when the teacher was perceived to be more directive. Since no other significant interactions occurred, the planned regression models could not be constructed. In supplementary analyses using the maximum number of cases available, the interaction involving achievement motivation remained significant for satisfaction (N = 307) but not for grades (N = 316). The occurrence of interactions involving achievement motivation in the population is questioned as is the generalizability of previous research findings within this ATI context. The replication issue is discussed and it is concluded that ATI research within the current context and in general must come to rely more upon literal, operational, and constructive replication if confidence in the endeavour is to be maintained.

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I. Introduction

A. Overview of the Problem

Educational researchers have spent considerable time and energy trying to delineate the factors which may enhance student performance and satisfaction in the classroom. One such line of research has been concerned with the relative effects of directive and nondirective teaching styles. The distinction "directive versus nondirective" has also been referred to as authoritarian versus nonauthoritarian, autocratic versus democratic, and teacher-centered versus student-centered. Directive teaching tends to be absolute, formal, and structured while nondirective teaching tends to be tentative, informal, and unstructured.

Much of the research on directive and nondirective teaching has been carried out to demonstrate the superiority of one style or the other in promoting greater student learning and/or higher student morale. The results of these endeavours present a confused and contradictory picture and neither approach can conclusively claim an advantage in terms of either performance or satisfaction.

In recent years it has been suggested that the failure to find significant and reliable teacher or instructional effects in general may be the result of ignoring student differences in the traditional research paradigm. Teacher or instructional characteristics which have systematic effects on learning and satisfaction may indeed exist but the

characteristics may have different and even opposing effects on different students. In other words, the effects of teacher and instructional variables may be mediated by student variables. Consequently, false conclusions may arise that certain teacher or instructional variables have little effect upon the outcome under investigation if pupil variables are not considered in concert with teacher and instructional variables.

An interactive model has been proposed for the study of teacher (instructional) and student dimensions in relation to the two main dependent variables, achievement and satisfaction. Traditionally, teacher and student effects have been considered separately, and if combined at all the resultant combination has usually been an additive one. The interactive approach acknowledges that the combined effect of a teacher variable and a student variable may be more than the sum of the separate effects of the teacher and student variables; the variables may also contribute to the variance in the criterion measure in a multiplicative manner. The concept of interaction is well grounded theoretically, empirically, and statistically and there is a rapidly expanding body of research, referred to as Attribute (or Aptitude) x Treatment Interaction (ATI) research, which deals explicitly with the interactions of student variables and educational treatments in relation to educationally relevant outcome variables.

Consider an example of ATI within the present context. Dowaliby and Schumer (1973) hypothesized that student anxiety and teacher directiveness are interactively related to performance. Dowaliby taught one section of an introductory psychology course in a directive fashion and one section in a more nondirective manner. In the directive class there was more teacher domination and greater structure, while in the nondirective class there was more student participation. Scores on two examinations based on the class work served as dependent variables. As predicted, low anxiety students earned higher grades when taught with a nondirective technique than when taught with a directive style. On the other hand, high anxiety students profited more from a directive approach. This study was substantially replicated by Domino (1975). No treatment main effect was found in either study.

Research data also lend support to the existence of similar interactive relationships involving 11 other student personological variables, teacher directiveness or aspects of teacher directiveness, and performance. Some evidence for such interactions has been found when measures of student authoritarianism, dogmatism, intelligence, convergent-divergent abilities, conceptual level, compulsivity, achievement motivation, achievement orientation, locus of control, independence-dependence, and extraversion-introversion have been employed. Analogous interaction effects have also been reported with student

satisfaction as the criterion.

ATI research has generally been initiated with the hope that the results would eventually be useful in formulating an empirically grounded mechanistic matching model for teacher and student characteristics which could optimize the chances for the maximization of individual potentialities. The objective, according to this line of thinking, is to search for strong interactions on which such models can be based. The emphasis is on steep attribute-treatment regressions; Cronbach (1967) has even suggested that we consciously create instructional treatments which will maximally interact with promising student variables.

Gehlbach (1979) has recently put forth an alternative tack for the application of ATI findings and methodology. He proposes that the eradication of steep attribute-treatment regressions "would remove instructional processes from the list of social forces that maintain inequalities of opportunity and achievement in our society" (p. 12). To him, the ATI approach is useful for discovering nonhorizontal attribute-treatment regressions and for evaluating the success of subsequent corrective procedures to alter instructional treatments so that their effects are more equitable across individual differences.

Perhaps the greatest value in ATI research lies, however, in its potential simply to shed light on the instructional process, and this value is inherent whether one embraces the instructional philosophy of Cronbach or

that of Gehlbach. In the long run, the elaboration of theory by jointly taking into account organismic and environmental variables relevant to educational outcomes can no doubt add to the insight and potentially change the perspective of educators.

Whatever the ultimate aim of the ATI researcher may be, to facilitate the construction of workable matching models, to aid in the eradication of attribute-treatment regressions, or to promote the elaboration of instructional theory, adherence to the principle of parsimony is cardinal. Within the present context, it appears that several of the interactive relationships involving different personological constructs may be redundant or overlapping. There is a fair degree of moderate intercorrelation among the student variables which have been fruitfully utilized and such correlativity directly suggests that some of the interactions which have surfaced may not be independent.

For example, dogmatism has been found to be correlated with authoritarianism, intelligence, divergent ability, conceptual level, anxiety, locus of control, and independence. There is some evidence that each of these variables is also involved in an interactive relationship with teacher directiveness when satisfaction is the dependent variable. It is conceivably possible that the primary interactive relationship concerns student dogmatism and that each of the other interactive relationships attains statistical significance because each of the other

personological variables is correlated with dogmatism. McCann and Fisher (1977), for instance, found that both student dogmatism and intelligence interacted with perceived teacher directiveness in regard to student satisfaction. However, multiple regression strategies revealed that the interaction of student dogmatism and perceived teacher directiveness could account for the interaction of student intelligence and perceived teacher directiveness but, conversely, the interactive relationship involving intelligence could not explain the interactive relationship involving dogmatism. The primary interactive relationship, the interactive relationship that afforded the most parsimonious explanation, in this case appeared to have dogmatism rather than intelligence at its core. Further research might disclose that one of the other related personological variables is more aptly viewed as being involved in the primary interactive relationship, or, that there are two or three or more interactions involving these particular student variables and perceived teacher directiveness which can account for unique variance in satisfaction.

This study is addressed to the simplification of the apparent multivariate nature of the interactive relationships of student personality and teacher directiveness to performance and satisfaction. If a free stepwise regression analysis of the 12 interactive relationships was carried out for each of the criterion

variables, it was expected that a lesser number of interactive relationships would emerge, weighted according to how much unique variance they can account for in the dependent variables. It was hoped that the resultant regression models might facilitate theory building, simplify ATI applications, and serve as bases on which to evaluate the variance accounting capacities of any new variables which might be implicated to be important within this interactive context.

B. Review of the Literature

Lewin, Lippitt, and White (1939) conducted what is now regarded as a classic study in the social psychology of leadership effectiveness. Groups of boys met after school for several weeks to engage in the making of masks and similar activities. They were supervised by adults who practiced authoritarian, democratic, or laissez-faire styles of leadership. The essential difference between the authoritarian and the democratic style was that authoritarian leaders directed their group members without group consultation while the democratic leaders invited group participation in determining the direction and nature of group activities. Laissez-faire leaders played a passive, directionless role. While the largest number of masks was produced under authoritarian leadership, 95% of the boys preferred democratic leadership. Laissez-faire leadership resulted in low productivity and low morale. It should be

pointed out, however, that the results were far from conclusive.

This pioneering exploration of the relative effectiveness of authoritarian and democratic leadership set a precedent for a myriad of studies which essentially sought to determine the superiority of democratic leadership or the superiority of authoritarian leadership in terms of morale and productivity.

Understandably, the comparison of authoritarian and democratic leadership spread rapidly into the classroom setting where the teacher is considered "leader" and the class is considered "group". In the classroom, a teacher who exhibits authoritarian leadership practices is generally referred to as "teacher-centered" or "directive", while a teacher who displays democratic leadership practices is generally referred to as "student-centered" or "nondirective".

McKeachie (1954) considers a classroom situation to be more student-centered than teacher-centered if there is a higher degree of one or more of the following: group cohesiveness, emphasis upon affective goals, instructor acceptance of inaccurate student statements, student participation in goal setting, ability of the group to more or less determine its own fate, time devoted to discussing personal problems and personal experiences, student participation, and student interaction.

Tuckman (1968) has put forth a similar but somewhat more elaborate definition of directiveness, and a scale for its measurement. According to Tuckman, teacher behaviors can be conceptually divided into those which are on a "structure" dimension and those which are on an "interpersonal" dimension. The directive teacher is viewed as one for whom extreme concern with order, procedure, and organization affects both the structure of the class and interpersonal relationships with the students. On the structure dimension, the directive teacher highly structures and plans the course and classroom activity, minimizes informal and group work (and even structures it when it is used), resists breaks in the pattern through the structuring of classroom and individual activity, and places a premium on factual knowledge derived from absolute sources. On the interpersonal dimension, the directive teacher maintains formal teacher-student relationships, minimizes students' opportunities to learn from their own mistakes, uses absolute and justifiable punishment, fosters a formal classroom atmosphere, and takes absolute responsibility for grades. On each dimension, a nondirective teacher displays the converse of these practices. Generally speaking, directive teaching tends to be absolute, formal, and structured while nondirective teaching tends to be tentative, informal, and unstructured.

As in the leadership research, the main dependent variables, morale and productivity, are applicable in the

classroom research. Morale is usually measured with a scale of satisfaction with, or preference for, the teacher or the course. Some indicator of level of achievement such as grades or scores on a standardized achievement test is usually employed to assess productivity.

Paralleling the course of leadership research, many researchers have sought to demomstrate the advantage of either directive or nondirective teaching in terms of learning and/or morale but the results have been largely inconsistent and inconclusive. After reviewing the earlier literature, McKeachie (1954) concluded that the hope that one method could produce significantly greater benefits than the other was probably unrealistic. Anderson (1959) extensively reviewed the literature dealing not only with directive and nondirective teaching but also with authoritarian and democratic leadership in general and concluded that it was "impossible to demonstrate that either of the two styles is most clearly associated with high productivity or high morale" (p. 204). He emphasized that the results of the directive-nondirective studies were "especially contradictory" and it could not be stated with any certainty that either style was associated with improved learning. However, he did grant the edge to nondirective teaching insofar as morale is concerned. Similarly, in a more recent review of the literature, Dubin and Taveggia (1968) reiterated that the "data demonstrate clearly and unequivocally that there is no difference" (p. 35) between

approaches, at least when the productivity criterion is final examination grades.

A number of researchers have suggested that the failure to find significant and reliable teacher effects in general may be the result of ignoring individual differences among students in the traditional process-product research paradigm (e.g., Arlin, 1975; Cronbach, 1967; Cronbach & Snow, 1977; Cunningham, 1975; Davis, Marzocco, & Denny, 1970; Domino, 1975; Dowaliby & Schumer, 1973; Gardner, 1974; Newsom, Eichens, & Looft, 1972). Such a position was spurred by Cronbach's APA Presidential Address of 1957 (Cronbach, 1957) in which it was forcefully argued that the experimental and correlational approaches should unite to form an interactional paradigm.

It now seems clear that neither organismic nor environmental variation alone can account for behavior (Vale & Vale, 1969) and that a successful scientific psychology must actively pursue principles which take into account the variance accounted for by the interaction of organismic and environmental variables (Endler & Magnusson, 1976; Magnusson & Endler, 1977). Generally speaking, Lewin's (1951) precept that behaviour is a function of personality and environment has been passingly acknowledged but seldom put into practice. This is not especially surprising given the apparent validity of Lewin's axiom and the depth of the methodological and conceptual difficulties which appear to be involved in carrying out effective person-environment

research (McCann & Short, 1982; Short & McCann, 1979).

ATI research is an endeavour within the bounds of instructional psychology and classroom dynamics (Berliner & Cahen, 1973) to look at educational outcomes such as student achievement and satisfaction in terms of the variance accounting capacities of the interactions of environmental and organismic variables. It is a research orientation rather than a research area and is developing parallel to the general area of interactional psychology (see Endler & Magnusson, 1976; Magnusson & Endler, 1977). The ATI approach recognizes that the combined effect of an educational treatment, either teacher based or instruction based, and a student variable may contribute to the variance in the dependent variable in a multiplicative fashion. There may indeed be educational treatments which have systematic effects on educational results but the treatments may effect different students in dissimilar and even contrary ways. If the effects of educational treatments can be moderated by student variables, misleading conclusions may be drawn that certain teacher or instructional variables have little influence upon the teaching outcome being considered unless pupil variables are considered in concert with teacher or instructional variables. It is hoped that ATI research will facilitate the development of an adequate theory of instruction by gradually fabricating a matrix of pupil characteristics and learning situations in relation to several educational product variables (Salomon, 1970). At

the least, the generalizations gained from jointly taking into account organismic and environmental variables relevant to educational outcomes can add to the insight and perhaps change the perspective of those actively involved in the educative task.

"Interaction" is a statistical term meaning that treatments of a study have significantly uneven and perhaps contrasting effects on different subgroups of subjects. Lubin (1961) has discussed two types of interaction effects. In the "ordinal" case the rank order of the treatments is constant across all levels of the subject variable. In the "disordinal" case the rank order of the treatments is different for different levels of the subject variable. The significance of main effects may be entirely meaningless if a significant disordinal interaction exists. A cautious interpretation of main effects can be made when a significant ordinal interaction is found if one restricts the explanation to the ranges of the variables represented in the study. Both ordinal and disordinal interactions are important in ATI research (Cronbach & Snow, 1977, p. 495).

For the purposes of illustration, consider two examples of interaction within the present context. A disordinal interaction was found by McCann and Fisher (1977) involving student dogmatism and perceived teacher directiveness in relation to student satisfaction with the teacher. The more nondirective the teacher was perceived to be, the more satisfied were the nondogmatic students and the less

satisfied were the dogmatic students. An ordinal interaction was reported by Tuckman (1968). Cognitively complex students were more satisfied with and tended to earn higher grades from nondirective teachers as opposed to directive teachers, whereas the less cognitively complex students reacted similarly to the two styles.

ATI research has uncovered a dozen personological variables which appear to moderate the effects of directive and nondirective teaching. Supportive data have been found when measures of student authoritarianism, dogmatism, intelligence, convergent-divergent abilities, conceptual level, anxiety, compulsivity, achievement motivation, achievement orientation, locus of control, independence-dependence, and extraversion-introversion have been utilized. The interactive patterns have been similar with achievement and satisfaction as the criteria.

In the following review of the literature, studies were considered if significant elements of the instructional treatment coincided with aspects of Tuckman's (1968) operational definition of directiveness which has been stated earlier. Of course, the basal degree of correspondence between Tuckman's definition of directiveness and the treatments reported to have been delivered by respective authors must remain a matter of personal judgement; restricting inclusion to studies which entirely and unequivocally meet Tuckman's criteria would reduce the relevant research to something less than a handful. To be

included, there also had to be some statistical evidence that the particular personological variable did indeed interact with directiveness. In other words, studies with nonsignificant findings were included if there was other evidence that the personological variable in question interacted with directiveness, or elements of directiveness, in relation to achievement or satisfaction, but excluded if there was no other evidence of such an interaction.

Interactions involving authoritarianism

"Authoritarianism" is conceptualized as a personality style revolving around a particular set of related beliefs and attitudes which are generally assumed to be clustered around nine components: conventionalism, power and toughness, destructiveness and cynicism, anti-intraception, superstition and stereotypy, projectivity, overconcern with sex, authoritarian submission, and authoritarian aggression (Adorno, Frenkel-Brunswik, Levinson, & Sanford, 1950). The extent to which a person embraces an authoritarian ideology can presumably be measured with some accuracy by the F-Scale (Adorno et al., 1950) or a modified version thereof.

After reviewing several early studies on the effects of teacher directiveness, Haigh and Schmidt (1956) described some of the student differences which might interact with directiveness:

> They suggest on the one hand the picture of a student who is flexible in his thinking, able to cope with inconsistencies and ambiguities, understanding of himself and probably able to enjoy and profit from the give and take of group discussion. On the other hand

> they suggest the picture of a student who seeks the definite, the concrete and the ordered, avoiding ambiguity and inconsistency, seeing himself (and life) in stereotyped ways and who is probably able to gain most in satisfaction and knowledge from a teacher centered class. (p. 300)

Although the description resembles that of two types of students at different ends of the authoritarianism continuum, few researchers have tried to provide empirical verification for such an interactive relationship.

Tuckman (1968) found that nonauthoritarian vocational high school students expressed greater satisfaction with nondirective teachers while authoritarian students showed little differentiation in their level of satisfaction with one teaching style or the other. Similarly, nonauthoritarian students earned higher grades from nondirective teachers, but authoritarian students received similar grades under both styles. Caution should be exercised, though, since the interaction effects were only found in nonvocational courses and only attained the .10 level of significance. Tuckman suggested that the full effect of the interaction may have been attenuated because in his sample the F-Scale scores were lower and had a narrower range than has usually been found in academic high school samples.

Teacher directiveness was estimated with the Student Perception of Teacher Style (SPOTS) scale which was developed by Tuckman specifically for this study. The items on the SPOTS scale are derived directly from his operational definition of directiveness. Essentially, each student rates his or her teacher on a 9-point scale on 17 items dealing

with perceived teacher behavior and the responses to the items are averaged or summed to obtain the student's rating of level of directiveness of the teacher. In Tuckman's usage of the scale, the mean student score for a class is taken as an index of the teacher's actual degree of directiveness.

McCann and Fisher (1977) furnished evidence that student authoritarianism and perceived teacher directiveness are interactively related to performance. One hundred and seventy-four students in two classes of each of six English teachers at the Grade 11, 12, and 13 levels in an Ontario secondary school rated their English teacher on the SPOTS scale. Students also expressed their attitudes toward their teacher on a teacher satisfaction scale and completed the F-Scale and the Dogmatism Scale (Rokeach, 1960). Each student's final English grade, IQ, sex, English teacher's sex, year, and academic program were determined from school files. A third dependent variable, "z-grades", was developed by computing the z-score of each student's grade, using each teacher's students as a subsample. It was thought that z-grades might be a better comparative index of standing across teachers. It was reasoned that grades can vary across teachers because of each teacher's accustomed mean and range and that this variability, which may be unrelated to actual student performance, is somewhat corrected with z-grades. Grades and z-grades correlated highly (r=.93) but satisfaction scores were not correlated with either grades or z-grades.

There was no evidence that student authoritarianism interacted with teacher directiveness (as calculated in the Tuckman study) in relation to either achievement or satisfaction. Of course, the possibility of the occurrence of a Type II error cannot be easily dismissed since only six teachers were included in the sample and they did not represent extreme scores.

However, when individual student SPOTS scale scores were used in the analyses as perceived teacher directiveness scores, meaningful relationships did emerge. Perceived teacher directiveness and student authoritarianism were interactively related to grades and $\underline{z}$-grades but not to satisfaction. The more nondirective the teacher was perceived to be, the higher were the grades of the nonauthoritarians and the lower were the grades of the authoritarians. The $\underline{z}$-grades of the nonauthoritarians and the authoritarians were both somewhat higher when the teacher was perceived to be less directive but the relationship was more pronounced for the nonauthoritarians.

In tangentially related research, Weiss, Sales, and Bode (1970) used teacher F-Scale scores as indicators of directiveness since it is generally assumed that authoritarian teachers use directive teaching styles (e.g., McGee, 1955; Maney, 1959). They found that authoritarian students were particularly dissatisfied with nonauthoritarian teachers while satisfaction for nonauthoritarian students was not related to teacher

authoritarianism. The results with grades as the criterion were parallel to those with satifaction, even when the effects of intelligence were taken into account. But as in the Tuckman study, the interaction effects were only significant at the .10 level, possibly in part because the academic high school sample consisted of only four teachers and 36 students. (The Weiss et al. study has been included in this review because they assumed that they were dealing with the directiveness dimension and not because there was any evidence that directive and nondirective teaching behaviors were indeed being demonstrated.)

Although only three studies have dealt with the interactive relationships of teacher directiveness and student authoritarianism to grades and satisfaction, a fairly consistent composite picture can be sketched. The two ordinal interactions found in the Tuckman and Weiss et al. studies are complementary, and taken together are suggestive of the disordinal interaction found by McCann and Fisher, at least when grades was the dependent measure. It is somewhat surprising that the McCann and Fisher research failed to turn up any sign of an interaction when the criterion was student satisfaction, particularly since they employed the same directiveness measure as Tuckman and the same satisfaction measure as Weiss et al. Taken globally though, the results of the three studies strongly suggest an interaction involving student authoritarianism, such that authoritarians perform better and are more satisfied in

directive classes while nonauthoritarians perform better and are more satisfied in nondirective classes.

Interactions involving dogmatism

"Dogmatism" is characterized as a closed-minded, rigid cognitive style. Dogmatism refers more to the structure of a set of beliefs and attitudes, while authoritarianism refers more to the adherence to a particular set of beliefs and attitudes. Dogmatism can be regarded as a "general authoritarianism" not oriented to any particular ideology (Barker, 1963). The Dogmatism Scale (Rokeach, 1960) is assumed to tap the degree to which a person can be considered to be dogmatic.

Kerlinger and Rokeach (1966) factor analyzed the F-Scale and the Dogmatism Scale together and provided some empirical support for the two concepts of authoritarianism put forth. Correlations between the two scales ranged from .54 to .77. When the items from both scales were factor analyzed, a common core of authoritarianism was found. However, when further factors were extracted the two scales were factorially discriminable and dogmatism appeared to be a more general form of authoritarianism.

There is evidence that dogmatism interacts with directiveness in a manner similar to authoritarianism. McCann and Fisher (1977) also reported that perceived teacher directiveness and student dogmatism were interactively related to grades, $\underline{z}$-grades, and satisfaction. However, the relationships involving grades and $\underline{z}$-grades

were better explained by the analogous interactive relationships of perceived teacher directiveness and student authoritarianism mentioned earlier. But with satisfaction as the criterion, the more nondirective the teacher was perceived to be, the more satisfied were the nondogmatic students and the less satisfied were the dogmatic students. This relationship was maintained even after the variance which could be attributed to the interactive relationship of perceived teacher directiveness and student authoritarianism was statistically partialled from the dependent variable.

In a following study, McCann and Hamilton (1978) provided further evidence that student dogmatism interacts with teacher directiveness in relation to satisfaction. More specifically, the results suggest that the structure dimension of directiveness plays a more active part in the interaction than does the interpersonal dimension of directiveness.

Four descriptions of a hypothetical professor were constructed from the polar descriptions on the items of the SPOTS scale. Two were based on the items of the structure dimension--directive-structure and nondirective-structure--and two were based on the items of the interpersonal dimension--directive-interpersonal and nondirective-interpersonal. A sample of 320 randomly selected introductory psychology students was divided randomly into four equal groups and each group was given one of the four descriptions. Students indicated their expected

degree of satisfaction with their hypothetical professor, responded to a shortened dogmatism scale (Troldahl & Powell, 1965), and completed a corresponding "structure" or "interpersonal" SPOTS subscale to show the profile of a professor with whom they would be maximally satisfied.

As expected, the interactive relationship of dogmatism and directiveness was significant for those receiving structure descriptions but was nonsignificant for those receiving interpersonal descriptions. On the structure dimension, dogmatism was positively related to satisfaction for those receiving directive profiles and negatively related to satisfaction for those receiving nondirective profiles. The interaction was disordinal. However, in indicating their preferences for maximal satisfaction, students generally preferred intermediate levels of teacher directiveness and their preferences were unrelated to dogmatism. Only one item on the structure subscale supported the expectation of an interactive relationship: dogmatic students preferred a professor who is fact-oriented while nondogmatic students preferred one who encourages independent thinking.

Taken together, the results of the McCann and Hamilton experiment suggest that student dogmatism does moderate satisfaction when the teaching style is perceived to be substantially directive or substantially nondirective on the structure dimension, but both dogmatic and nondogmatic students by and large may prefer a teaching style that is

neither excessively directive nor nondirective. Of course, the results must remain merely suggestive, given the degree of artificiality inherent in the research method employed.

In a study by Grippin (1976), one section of an undergraduate child psychology class was taught with a traditional lecture format and another section was taught with a more independent modularized approach which utilized a weekly discussion class. With scores on a multiple choice test covering course content as the dependent variable, it was found that dogmatic students suffered while nondogmatic students benefited from the more nondirective approach.

Except for the lack of a significant difference in performance between dogmatic and nondogmatic students in Grippin's directively taught class, the results of the three studies are congruous and consistent. Apparently, directive teaching is more suitable for dogmatic students and nondirective teaching is more suitable for nondogmatic students. On the basis of limited evidence student dogmatism appears to be a promising mediating variable, particularly insofar as satisfaction is concerned.

Interactions involving intelligence

Cronbach (1967, p. 30) pointed out that general intelligence may not be particularly useful within the interactive context because it tends to be correlated with successful performance in most instructional circumstances. However, after reviewing a number of studies dealing with general and specific abilities, Cronbach and Snow (1977, p.

496) conclude that, contrary to their own expectations, "the abilities that most frequently enter into interactions are general." In the ATI research which centres on directiveness as an instructional variable, it appears that only measures of general intelligence, verbal intelligence, or quantitative intelligence have been used.

McCann and Fisher (1977) also considered the potential interactive relationship of student intelligence and perceived teacher directiveness to achievement and satisfaction. No support was found for an interaction effect when achievement was the dependent variable but there appeared to be some support for such an interactive relationship when satisfaction was the outcome variable. Satisfaction and intelligence were positively related when the teacher was perceived to be nondirective and negatively related when the teacher was perceived to be directive. However, the variance accounted for by the interaction of student intelligence and perceived teacher directiveness could be statistically explained by the significant interaction of student dogmatism and perceived teacher directiveness. Alternatively though, the variance accounted for by the interaction of student dogmatism and perceived teacher directiveness could not be explained by the interaction involving intelligence.

A disordinal interactive relationship involving general ability, an aspect of teacher directiveness, and performance was reported by McKeachie (1954). Teachers were classified

according to how much opportunity students had to state opinions and ask questions. Low ability students performed better when there was little opportunity to speak out while high ability students performed better when there was greater opportunity to speak out.

Wispe (1951) compared the achievement of students in sections of a college social relations course which were either directively or nondirectively taught. Four instructors were asked to teach their sections in a formal, subject-matter-oriented style and four instructors were asked to teach their sections in an informal, student-oriented way. Observations were made to ensure that the instructors were fulfilling their assigned roles. Ability was determined from SAT scores. Persons low in ability profited more from directive teaching but there was no difference for persons high in ability. There was also no main effect for directiveness.

Ward (1956) examined the test performance of students in directively and nondirectively taught college physics classes. Although Ward did not explicitly test ATI effects, Cronbach and Snow (1977, p. 321) conclude that directive teaching was superior to nondirective teaching for students low in ability. Students of high ability did equally well under both styles.

Schantz (1964) exposed groups of high and low ability pupils to either direct or indirect teaching. "Directiveness" was decided on the basis of Flander's system

(Amidon & Flanders, 1963; Flanders, 1966). According to Amidon and Simon (1965) who had access to the full report, high ability pupils scored higher on a science test after indirect teaching than after direct teaching.

Flanders (1965) compared student achievement in the social studies and geometry classes of directive and permissive teachers at the Grade 8 level. In both courses permissive teaching was slightly more advantageous for students with higher intelligence. The effects were weak even though 31 teachers and over 300 students were included in the sample.

Bar-Yam (1969) examined the potential interaction of intelligence and perceived goal-direction, formality, and organization in relation to performance and satisfaction. "Perceived" referred to mean student perceptions within each class. Although there appeared to be no significant interactions in relation to achievement, Bar-Yam nevertheless concluded from a supplementary analysis that highly intelligent students did better in more nondirective classes while there was no difference for less intelligent students. With course satisfaction as the criterion, there was a significant interaction between intelligence and perceived organization. Organization seemed to affect intelligent students but not dull students.

Guetzkow, Kelly, and McKeachie (1954) looked at the performance and method preferences of students in psychology classes which varied on a continuum of directiveness. Eight

teaching assistants taught each of their three sections with a different teaching style: recitation, discussion, or tutorial. Ability did not interact with teaching style in relation to either final examination grades or the teaching style preferences of the students. It seems plausible, however, at least in regard to grades, that the effects may have been attenuated because all of the students shared the same lectures, text, and assignments.

Herman, Potterfield, Dayton, and Amershek (1969) also tested the interaction of ability and directiveness in relation to achievement. Mean class ability rather than individual ability was used in the analysis. There was no sign of an interaction effect, perhaps because only 18 classes were included in the sample and the method of analysis lacked power (Cronbach & Snow, 1977, p. 321).

Hutchinson (1963) compared the achievement of students in experimental classes in which the teachers attempted to promote independent thinking to students in control classes in which the teachers demanded the recall of given information. Cronbach and Snow (1977, pp. 329-332) reanalyzed Hutchinson's data and concluded that no generalizations could be made about the existence of an ability x style interaction.

In tangentially related research, Wallen and Wodtke (1963) reported that "dull, dependent primary children seemed to learn most when their teachers were cold and controlled, while the able, independent children did better

with permissive teachers" (Cronbach & Snow, 1977, p. 462). Of course, intelligence and dependency appear to have been confounded, so the significance of the finding in the present context is open to question.

Studies by Rizzuto (1970), Babikian (1971), and Olander and Robertson (1973) failed to produce any evidence of interactive relationships involving student ability. It should be stressed, however, that according to their authors, inductive and deductive approaches were compared in the Rizzuto study and expository and discovery teaching were compared in the studies of Babikian and Olander and Robertson. The actual treatment delivered to the subjects in the Rizzuto study, as described, did not seem to clearly embody aspects of the directiveness dimension but treatments in the Babikian research were at least superficially suggestive of directive and nondirective techniques. The treatments of Olander and Robertson did seem to involve directiveness as it is understood here but it should be noted that three subscores on the Stanford Achievement Test were used instead of a more general intelligence measure and, according to Cronbach and Snow (1977), regression slopes were calculated incorrectly. Cronbach and Snow (p. 313) "doubt that any interaction in the population is indicated by these data."

Although they do not deal explicitly with classroom instruction, a series of studies by Calvin, Hoffman, and Harden (1957) do seem relevant to the present discussion.

Calvin et al. experimentally compared the effects of authoritarian and permissive supervision on groups of dull and bright students during a "Twenty Questions" problem solving task. High and low ability groups of six to eight undergraduates were formed by selecting from the upper and lower extremes of general ability. Number of questions needed to solve a problem and percentage of problems solved served as the two dependent variables. Dull groups performed significantly better in the authoritarian condition and bright groups performed significantly better in the permissive condition. Dull groups also enjoyed the experiment more when they were in the authoritarian condition but bright groups enjoyed the experiment when they were in either condition. In two replications of the experiment the results were in the same direction but did not achieve statistical significance, possibly because of the small number of students involved in the experiments.

In summary, the hypothesis that intelligent students thrive in a nondirective atmosphere while less intelligent students are more successful with directive teaching has gained a fair degree of support in the literature to date. In regard to achievement, a number of ordinal interactions have been reported (Bar-Yam, 1969; Flanders, 1965; Schantz, 1964; Ward, 1956; Wispe, 1951). These studies are evenly split as to whether more intelligent or less intelligent students are more sensitive to differences in teacher directiveness. Taken together, they give credence to the

disordinal interactions reported by Calvin et al. (1957), McKeachie (1954), and Wallen and Wodtke (1963). The lack of findings in the Guetzkow et al. (1954) experiment might be attributable to the lack of strength of the treatments, while the failure of the Herman et al. (1969) research seems quite possibly to be linked to the lack of statistical power in the design. As for other failures to find interaction effects, the reported results of Olander and Robertson (1973) apparently cannot be trusted and data used in a secondary analysis are not readily accessible, the studies by Rizzuto (1970) and Babikian (1971) did not seem to adequately involve directiveness, and the Hutchinson (1963) research utilized only one limited aspect of directiveness. Only the McCann and Fisher (1977) finding of no interaction seems not to offer a ready apology. Understandably, fewer studies have dealt with the interaction of satisfaction, intelligence, and directiveness. Nevertheless, the ordinal interactions reported by Bar-Yam (1969) and Calvin et al. (1957) are complementary and taken together they are supportive of the disordinal interaction found by McCann and Fisher (1977). It is noteworthy that the results of all of the studies which reported significant interactions in regard to grades and satisfaction were in the appropriate direction to offer support to the general hypothesis.

Interactions involving convergent-divergent abilities

Convergent thinking refers to deductive problem solving which converges upon the one "correct" solution to a

problem. The ability to think convergently loads heavily on general intelligence. Divergent thinking involves generating a number of alternative solutions to a problem and has often been employed as an operational technique for assessing creativity. The nature of the problem dictates the kind of thinking which is most beneficial but persons differ in their capacity and preference for generating each of the two cognitive strategies. The correlations reported between convergent and divergent ability have generally been low indicating that they are separate abilities (Zussman & Pascal, 1973).

Convergent and divergent ability have been suggested as student variables which may interact with teacher directiveness in relation to performance and satisfaction. Brophy and Good (1974) delineate the nature of the expected interactive relationships:

> In general, however, data from several sources suggest that both convergent teachers and convergent students prefer a well-organized businesslike, achievement-oriented classroom with a clear-cut structure established primarily by the teacher. In contrast, divergent teachers and students are less achievement and structure oriented, preferring instead a teaching approach involving minimal structure, highly personal interactions, and encouragement of everyone to follow his own interests. (p. 251)

Although the number of studies utilizing measures of convergent or divergent ability within the present context is extremely limited, the findings are consistently supportive of this interactive pattern.

Domino (1975) made a fairly direct test of the hypothesis that divergent ability and teacher directiveness are interactively related to performance. Of 328 undergraduates in an English course, 20 scoring high and 20 scoring low on a test of divergent ability were assigned to "two sections taught in a traditional manner and two sections taught in a 'tutorial' manner that emphasized close interaction between teacher and student and placed a premuim on the generation of ideas related to the creative and analytical aspects of poetry" (p. 10). Although there were no significant main effects for teaching style or divergent ability on a common final examination of course content, high divergent students scored higher under the seminar style while low divergent students earned higher scores when taught in the traditional manner.

Doty (1967) exposed introductory pyschology students to a 2-week section on physiological psychology using either a conventional lecture, a taped lecture, or a small group discussion method. For the purposes of this review, the taped lecture condition can be disregarded. Performance was measured with a multiple-choice test based on course content; satisfaction was gaged with an attitude scale of favourability toward the teaching method at the end of the treatment period. Doty's data show that divergent ability is positively related to achievement in small-group discussion classes and negatively related to achievement in conventional lecture classes. Doty's analysis relied

entirely on separate correlations for each sex within each condition. Except for the correlation between divergent ability and achievement for males in the conventional lecture condition, which approached significance, all of the correlations pertaining to the interaction involving achievement were significant. In regard to satisfaction, all of the correlations were in the right direction but none were significant. Such an analytical technique is not particularly powerful and "there may be other interactions in the data that the analysis failed to make evident" (Cronbach & Snow, 1977, p. 472).

In a study of instructional preferences, Ycas and Pascal (1973) found that convergent students preferred lectures, professors who employ a high degree of structure, structured study with another student, and computerized instruction. Divergent students preferred student-centered seminars, relaxed but stimulating professors, free-wheeling student-run study with another student, and independent study courses. The preferences of convergent and divergent students seem to differ on the directiveness dimension, convergent students preferring directive teaching strategies and divergent students preferring nondirective techniques.

Interactive relationships involving convergent ability appear to be the converse of interactive relationships involving divergent ability. Since convergent and divergent ability tend to be uncorrelated, it may be worthwhile in future research in this area to measure both kinds of

ability and scale subjects according to the degree to which they are more or less convergent than divergent in their capacities. Interactive relationships may be attenuated if both abilities are not taken into account since persons who are high or low on one ability may also be high or low in a parallel fashion on the other ability. Therefore, for example, a person who is high in divergent ability and low in convergent ability may be much more satisfied with a nondirective teaching style than a person who is high on both divergent and convergent ability, even though they both have the same divergent ability score. Such a composite variable should increase the power of ATI research employing these variables.

Interactions involving conceptual level

Harvey, Hunt, and Schroder (1961) developed a conceptual system theory which resembles a quasi stage theory of authoritarian tendencies, the progression being from a set of characteristics in the first stage or system resembling authoritarianism to a set of characteristics in the fourth stage or system not unlike nonauthoritarianism. Similar in focus to Rokeach's (1960) theory of dogmatism, "system" refers to the organizational structure through which information is processed rather than to the content of the information that is processed. Systems essentially vary along dimensions of abstractness and integrative complexity.

Hunt (1971) has evolved the theory into a more continuous variable he refers to simply as "conceptual

level" (CL). CL represents a continuum of cognitive complexity. High CL persons are creative and flexible, relatively tolerant of stress, and tend to engage in a high degree of exploration, while low CL persons are relatively incapable of developing their own concepts, categorical, and highly dependent upon external standards.

At least 10 studies have reported positive correlations between CL and general ability (e.g., Chan, 1975; Noy & Hunt, 1972; Raphael, 1975). According to Hunt, Butler, Noy, and Rosser (1978), persons low in ability are almost always low in CL but persons high in ability differ dramatically in CL. Therefore, the more select the sample is in terms of ability, the lower is the correlation between ability and CL.

Hunt (1971) states that any attempts to match student conceptual levels to teaching styles should consider the degree of structure in the style as the critical variable:

> The heart of the CL matching model is a generally inverse relation between CL and degree of structure: Low CL learners profitting more from high structure and high CL learners profitting more from low structure, or in some cases, being less affected by variations in structure. (p. 44)

Several studies have provided support for this assertion but few studies have employed environmental variables which are closely related to teacher directiveness as it is defined here. In light of the strong structure component of directiveness, this is somewhat surprising.

Tuckman (1968) has made one of the most direct tests of the hypothesis that performance and satisfaction are interactively related to CL and teacher directiveness. It should be noted, however, that Tuckman used an objective test (Interpersonal Topical Inventory) for assessing CL, and it is based more on the earlier "conceptual systems" approach than on the CL approach per se. Tuckman found that System IV students, at least those in vocational courses, showed less preference for, were less satisfied with, and tended to earn lower grades from directive teachers. Students with lower conceptual systems reacted similarly to the two styles.

King (1974) also tested the hypothesis using a vocational secondary school sample and Tuckman's measure of directiveness. Unlike Tuckman, King gaged CL in the conventional manner with the Paragraph Completion Test (Hunt, Lapin, Liberman, McManus, Post, Sweet, & Victor, 1968). With grades in reading and shop classes as the dependent variables, no interactions were significant. A measure of satisfaction was not included in the test battery.

Similarly, Vinson (1977), with a sample of Black American secondary school students, found no interactions using Tuckman's measure of directiveness and the Paragraph Completion Method with teacher assigned grades in English and social studies as the criterion and the effects of intelligence statistically controlled.

Zampogna, Gentile, Papalia, and Silber (1976) did find significant disordinal interactions using Hunt's Paragraph Completion Method and classes exposed to teaching strategies which seemed to differ on the dimension of directiveness. A traditional and a more individualized environment were experienced for one semester each, in a balanced order, by 154 secondary school students in French and Spanish classes. The traditional environment was characterized in part by teachers teaching their class as a whole, unilaterally structuring all classroom activities, assigning the same homework to all students, and determining what additional language games, films, cultural activities, and conversational topics were introduced and used. In the individualized environment, students worked alone, one-to-one, or in small groups approximately 80 percent of the time, students cooperated with the teacher in planning their time and kept records of their own progress, and one class period per week was set aside "for large group activities such as films, guest speakers, cultural presentations by the teacher or students and analysis and reaction to classroom activities and procedures" (p. 444). After experiencing both strategies, students indicated the learning environment they preferred and which environment they felt they needed to maximize their achievement. As expected, students with low conceptual level scores had a strong preference and need for a traditional teaching approach while students with high conceptual level scores

had a strong preference and need for a more individualized teaching approach. On a test of speaking skills, which was one of four achievement tests given, students with a high conceptual level had higher mean speaking gain scores in the individualized environment while students with a low conceptual level had higher scores in the traditional environment.

In a study by Robertson (1973), all subjects were exposed to two teaching methods which differed in the degree of structure. Low CL subjects, as predicted, judged the more structured treatment (lecture) to be more helpful for learning than did the high CL subjects. Surprisingly, there were no differences between CL groups when they were asked which treatment they liked best.

McLachlan (1969) asked subjects to give their own impressions of Picasso's "Guernica" after being exposed to either a lecture or a discovery learning condition aimed at gaining familiarity with the painting. Persons with low CL performed better in the more structured lecture than in the discovery condition. There were no differences for subjects with high CL.

Hunt (1971) also mentions two other studies which lend support to his contention that instructional structure and CL are interactively related to performance. Heck (1968) found that the communication skills of persons with low CL improved more in a structured human relations course while persons with high CL gained more from an unstructured

sensitivity training group. Bundy (1968) found that a structured guide in a course on effective decision making was beneficial for administrators with low CL but was detrimental for administrators with high CL. The extent to which the treatments in these two studies resembled directive and nondirective teaching appears rather questionable, particularly so in respect to Bundy's research.

The evidence for an interactive relationship between CL and teacher directiveness with performance as the dependent variable appears to be somewhat tenuous and inconsistent. Tuckman (1968), Zampogna et al. (1976), McLachlan (1969), Heck (1968), and Bundy (1968) each provided data which point to the existence of such an interaction. Only Tuckman specifically dealt with teacher directiveness, but when King (1976) and Vinson (1977) used the same directiveness measure as Tuckman no significant effects were found. This is particularly disturbing in light of the rather indirect nature of the majority of the corroborating evidence. Little work has been done with satisfaction as the dependent variable. Tuckman's data do support an interaction involving satisfaction but the results of Robertson's (1973) study are equivocal. Rather strong evidence was obtained in regard to "preference" and environment "needed for maximum achievement" in the study of Zampogna et al. (1976).

Cronbach and Snow (1977) concluded that:

> the findings of the Hunt program suggest, though weakly and inconsistently, that Low-CL students are helped by more directive teaching, whereas Highs do better when they have more control over the situation. (p. 381)

After a brief review of the literature on the interactions of student and teacher characteristics, which included several studies not pertaining to directiveness, Brophy and Good (1974, p. 267) were somewhat more generous in their appraisal of the CL research. They concluded that CL was, of the variables they reviewed, "the most promising as a basis for profitably matching teachers and students."

Interactions involving anxiety

Several researchers have reasoned that pupil anxiety should interact with teacher directiveness in relation to achievement and satisfaction. Perhaps McKeachie (1951, 1961) is most typical in his argument. McKeachie reasons that since anxiety is increased by uncertainty, the anxious person will be most anxious in nondirective classes "where the instructor's organization is poor and the students have little awareness of where they are going and what will happen next" (1961, p. 134). Anxiety control is facilitated in a highly structured classroom. Furthermore, lack of structure increases anxiety, which in turn inhibits spontaneity, which is itself beneficial in an unstructured classroom (McKeachie, 1951, p. 158). It is assumed that when the generally anxious student is able to keep his anxiety responses at a minimum, he is more able to concentrate on the task and should, almost by definition, also be more satisfied and content.

Perhaps the strongest support for the interactive prediction is contained in a report by Dowaliby and Schumer (1973), which has been mentioned earlier. Dowaliby taught one section of an introductory psychology course according to a student-centered prescription and another according to a teacher-centered prescription. An anxiety scale was administered at the beginning of the semester. Scores on two multiple-choice tests based on class content served as the performance criteria. The analysis revealed significant disordinal interactions but no treatment main effects. High anxiety students achieved higher scores in the teacher-centered class than in the student-centered class while the opposite effect occurred for low anxiety students. The experiment was successfully replicated by Domino (1975).

Dowaliby and Schumer also carried out an interesting supplemental study. Students in an introductory educational psychology course responded halfway through the term to an anxiety scale and a questionnaire designed to appraise the perceived structure of the course. Two course examinations were used as dependent variables. Surprisingly, when extreme scorers on the perceived structure measure were retained for analysis, essentially the same disordinal interaction emerged as in the earlier manipulative study. That is, even though the teaching style was held constant, high anxiety students received higher grades when they perceived the course to be structured while low anxiety students did better when they perceived the course to be unstructured.

Harmon's (1978) doctoral research dealt with the interactive relationship of anxiety and structure to learning at the elementary school level. Highly structured teaching resulted in greater gains in knowledge for high anxiety fifth and sixth graders. In contrast, the achievement of low anxiety students was enhanced relative to that of high anxiety students when the teaching was fairly unstructured.

Grimes and Allinsmith (1961) compared the performance of anxious children exposed to a structured, authoritarian reading program and a less structured, whole-word approach during the first two years of elementary school. The treatments in the Grimes and Allinsmith study cannot confidently be regarded as full-blown directive and nondirective contrasts, at least not from the information which has been provided by the authors. The findings are significant and in the expected direction but probably should be looked upon as suggestive rather than as strongly supportive of the general interactive hypothesis. With IQ statistically controlled, the correlation between achievement on a Grade 3 reading test and anxiety was -.02 in the structured program and -.23 in the unstructured program. Children in the structured classes generally did better than children in the unstructured classes but the anxious pupils were particularly handicapped in the unstructured classes.

At another point in their paper, however, Grimes and Allinsmith (1961, p. 265) compared the mean achievement scores of groups comprised of pupils extremely high-high, high-low, low-high, and low-low on anxiety and compulsivity. If these mean scores are plotted for high and low anxiety pupils, a clearly disordinal interaction emerges. On the basis of these data, which Grimes and Allinsmith did not analyze in this manner, it appears that high anxiety pupils achieved to a higher degree in directive classes while low anxiety pupils achieved to a greater extent in nondirective classes.

Duffey (1974) predicted that on an achievement test given after a 1-week course on crime and delinquency at the Grade 9 level, high anxiety students would score higher than low anxiety students in a "democratic" classroom while low anxiety students would score higher than high anxiety students in an "authoritarian" classroom. The rationale for the alternative prediction is not stated in the report available to the author. In any case, the hypothesis was not substantiated. But the findings did not lend any support to the usual hypothesis either.

Other researchers have also more or less indirectly tested the interactive proposition. Bennett (1976) and Mann (1969), using cluster analytic strategies, concluded that anxious students preferred teacher-centered approaches. Bennett also uncovered a similar pattern for achievement relationships. Heil, Powell, and Feifer (1960) too found

that "anxious students had a great advantage with superior, orderly teachers". (Cronbach & Snow, 1977, p. 459).

Research carried out by Porteus (1976) tends to complicate the nature of the interactive relationships of anxiety and directivenesss. Porteus found that neither anxiety nor intelligence alone interacted with directiveness but that combinations of the two personological variables did enter into such an interaction. A directive approach was beneficial for able-anxious and nonable-nonanxious students while a nondirective style improved the performance of able-nonanxious and nonable-anxious students. There was also some evidence that nonable-anxious students were more satisfied with the nondirective than with the directive approach.

Peterson (1977, 1979) employed four treatments containing different combinations of structure and participation--high structure-low participation, low structure-high participation, high structure-high participation, and low structure-low participation. The first two resemble directiveness and nondirectiveness respectively. In the 1977 study, carried out at the Grade 9 level, nonable-nonanxious pupils had higher achievement with directive teaching, as in the Porteus study. However, this finding was not replicated in the 1979 study carried out with college students. The 1977 research also employed student attitude (toward the teacher, the instructional method, etc.) as a dependent variable but no significant

interactive relationships emerged.

In summary, high anxiety students did better with directive instruction in the studies of Dowaliby and Schumer (1973), Domino (1975), Harmon (1978), Grimes and Allinsmith (1961), Bennett (1976), Mann (1969), and Heil et al. (1960). Each of these researchers also reported that low anxiety students did better with nondirective instruction except Bennett, Mann, and Heil et al., who concluded that there were no differences for low anxiety students. Only Duffey (1974) and Peterson (1979) found no differences for low or high anxiety students but the results of the Porteus (1976) and the Peterson (1977) studies remain puzzling and do not submit readily to interpretations based on either anxiety or ability.

Little can be said about the interactive relationship in regard to satisfaction. Only Bennet (1976), Porteus (1976), and Peterson (1977) have given it any consideration. Bennett's study was far from a direct test of the hypothesis but he did report that high anxiety pupils preferred directive teaching while low anxiety pupils showed no preference. In contrast, Porteus found that anxious students low in ability were more satisfied with the nondirective approach. This finding is in direct opposition to Bennett's finding and to the findings of McCann and Fisher (1977), Bar-Yam (1969), and Calvin et al. (1957), who used ability rather than anxiety as the student variable. Peterson found no interactive relationships involving attitude. More

research with satisfaction as the criterion is clearly necessary before confident conclusions can be reached.

Interactions involving compulsivity

The compulsive person tends to defend against anxiety by manifesting an overly strong need to be methodical and to have the environment arranged in an orderly fashion (Levitt, 1967, p. 25). Motivationally and perceptually oriented by excessive concerns about order and exactness, the compulsive person can be described as "relatively rigid, preoccupied with small details, inhibited in spontaneity, conforming, perfectionistic, seeking certainty, and intolerant of the ambiguous or incongruous situation" (Grimes & Allinsmith, 1961, p. 252).

Comrey (1965) factor analyzed scores on a number of items on several personological dimensions and isolated a "compulsion" factor with the following loadings: need for order (.72), love of routine (.62), drive to finish (.61), meticulousness (.55), cautiousness (.53), impulsiveness (-.37), and personal grooming (.35). The similarity to the description by Grimes and Allinsmith seems evident. It should be noted that "need for order", which had the heaviest loading, has been operationalized by Edwards (1959) as a manifest need to:

> have written work neat and organized, to make plans before starting on a difficult task, to have things organized, to keep things neat and orderly, to make advance plans when taking a trip, to organize details of work, to keep letters and files according to some system, to have meals organized and a definite time for eating, to have things arranged so that they run

smoothly without change. (p. 11)

Again, the similarity of "need for order" to the description of compulsivity by Grimes and Allinsmith is apparent.

The Grimes and Allinsmith work (1961) reviewed in the preceding section on anxiety also considered the potential interactive relationship of pupil compulsivity and teaching structure to achievement. Compulsive children did perform at a higher level with the structured approach than with the unstructured approach. Compulsive children also performed better than noncompulsive children in the structured classes. However, the interaction effect was very weak and was nonsignificant when anxiety was statistically taken into account (Cronbach & Snow, 1977, p. 415).

Goldberg (1968) found that student compulsivity and perceived teacher "authoritarianism" interacted in relation to the self-reported amount of self-initiated and required work that students carried out, in a sample of junior high school boys and their male social studies teachers. Compulsive students did less while noncompulsive students did more when the teacher was perceived as nonauthoritarian. The items used to tap the perceived authoritarianism of the teacher characterized the authoritarian teacher as "strongly directive, impatient with academically inferior pupils, and generally rejecting of pupils" while the nonauthoritarian teacher was characterized as "permissive, more concerned with individual pupils' needs, and generally accepting of pupils" (p. 3).

Two other studies at least superficially resemble ATI studies employing compulsivity and directiveness as independent variables. Bar-Yam (1969) reported that secondary school students who scored high on Edward's (1959) Need for Order subscale showed a marked disadvantage in terms of achievement in classes where teaching was perceived to be more goal-directed and structured. When satisfaction was the criterion, the interactive relationship was nonsignificant. It should be recalled that "perceived" scores referred to the average perception of students in a class, rather than to individual student perceptions, in Bar-Yam's research. Perceived formality and perceived organization also entered into significant interactions with achievement and satisfaction as the criterion variables. Need for order was related to achievement as a function of formality and to satisfaction as a function of organization, according to Cronbach and Snow (1977, p. 464).

Smith, Wood, Downer, and Raygor (1956) also provided data that may be interpreted to mean that compulsive students are at a disadvantage with directive teaching while noncompulsive students benefit from such an approach. Smith et al. did not use a measure of compulsivity per se but instead a measure of "permeability". How similar permeability is to compulsivity is open to question but Cronbach and Snow (1977) did draw a parallel between the two constructs:

> Synonyms suggested for "permeable" are schizoid and disorganized; it thus seems to resemble the low compulsivity of the Grimes study. (p. 416)

Smith et al. exposed eight groups of university remedial reading students to directive teaching for a few weeks and then switched to nondirective teaching for a similar length of time. The order of treatments was reversed for eight other equated groups. Only anxious students were included in the analysis. Permeable students made greater gains with directive teaching; nonpermeable students made greater gains with permissive teaching.

The evidence for a predictable interactive pattern with compulsivity as the student variable is rather weak. The Grimes and Allinsmith and Goldberg findings tend to support one interactive pattern: compulsive students profit from directive teaching while noncompulsive students profit from nondirective teaching; the findings of Bar-Yam and Smith et al. another: noncompulsive students benefit from directive teaching while compulsive students benefit from nondirective teaching. It might be argued that the research supporting the first pattern is of a more direct nature and that it is therefore the favoured pattern on the basis of limited evidence. Nevertheless, it is not clear from the extended definitions of compulsivity whether students <u>should</u> do better in a directive or a nondirective classroom. For example, it might be argued that being "inhibited in spontaneity" should make success more difficult in a nondirective situation where a substantial degree of

interpersonal interaction is expected, but being "preoccupied with small details" and "perfection" might compensate for the lack of spontaneity and promote success in projects where there is a lack of external guidance. On the other hand, "need for order" may override "meticulousness" and "drive to finish" and foster productivity in a directive class. Evidence for interactions involving satisfaction is scant indeed, with only Bar-Yam's perceived organization variable giving a positive hint. However, that should not be looked upon as particularly damaging since of the four works cited here, only that of Bar-Yam considered satisfaction as a criterion.

Interactions involving achievement motivation

"Need for achievement" is often referred to as the "achievement motive". It may be defined as an energizing condition that causes the individual to seek to achieve his internalized standards of successful performance (Atkinson & Feather, 1966). In Atkinson's elaborated theory of achievement motivation (Atkinson, 1964; Atkinson & Feather, 1966), both need for achievement and anxiety determine resultant achievement motivation. Persons who are high in need for achievement and low in anxiety are said to have high achievement motivation; individuals who are low in need for achievement and high in anxiety are said to have low achievement motivation. Persons high in achievement motivation perform better in and choose achievement situations where the probabilty of success is intermediate,

whereas persons low in achievement motivation perform better in and choose achievement situations where the probability of success is either relatively high or relatively low but not intermediate.

Cronbach (1967) refers to high achievement motivation as constructive motivation and to low achievement motivation as defensive motivation. According to his formulations:

> defensive pupils will learn most if the teacher spells out short-term goals, gives a maximum of explanation and guidance, arranges feedback at short intervals to keep the pupil from getting off the track--in general, if the teacher maximizes opportunity for dependence. The constructives, on the other hand, should face moderately difficult tasks where intermediate goals are not too explicit; feedback should be provided at intervals, for the purpose of teaching them to judge themselves rather than for motivational support. Perhaps these are the pupils most apt to profit by a shift from didactic teaching to learning by discovery. (pp. 35-36)

Empirical support for such an hypothesis is sparse, equivocal, and sketchily reported. McKeachie (1961) found that the performance of students high in need for achievement and low in anxiety declined in classes where the requirements were clear, students' comments were corrected, and tests were announced in advance. The performance of students low in need for achievement and low in anxiety increased under such conditions. At least for students low in anxiety, need for achievement appeared to interact with explicitness of standards.

Other work adds general support to the findings of McKeachie without including a measure of anxiety. Patton (1955) found that students high in need for achievement

learned more and were more satisfied in an extremely nondirective class in which there were no exams, assigned readings, or lectures, and the students decided how and on what they would be evaluated. Koenig and McKeachie (1959) found that females with high need for achievement preferred independent work or small group work to lectures. Doty (1967) similarly reported that, for females, need for achievement was significantly negatively related to achievement in lecture classes and positively related, although not significantly so, to achievement in small-group discussion classes.

Failures to find interaction effects have also been reported. Doty (1967) found that the magnitudes of the significant positive correlations between need for achievement and achievement test scores in lecture and small-group discussion classes were similar, at least for males, suggesting the absence of an interaction effect. Bar-Yam (1969) found no interactions involving need for achievement and the perceived goal-direction, organization, and formality of instruction.

Although none of the studies has been an explicit test of the interactive relationships of student need for achievement and teacher directiveness to grades and satisfaction, there does seem to be somewhat indirect support for the underlying hypothesis. Nonsignificant interactions have been reported but all of the significant results taken together point to the superiority of directive

teaching for students low in need for achievement and to the superiority of nondirective teaching for students high in need for achievement.

Interactions involving achievement orientation

"Achievement orientation", as it is used here, is measured with the Achievement-via-Independence (Ai) and the Achievement-via-Conformance (Ac) scales of the California Psychological Inventory (Gough, 1957). The two scales identify the motivational and interest factors which facilitate achievement in any setting where positive regard is given to autonomous and conforming actions, respectively. In other words, the two scales purport "to distinguish independent self-sufficiency in achievement-related activity from an orientation toward achievement by means of conforming to other's expectations" (Snow, 1976, p. 54).

Domino (1968, 1971) carried out two studies, which Cronbach and Snow (1977, p. 442) have referred to as "exemplary investigations," relating Ai and Ac scores to performance under teaching styles which are similar to those defined as nondirective and directive by McKeachie (1954) and Tuckman (1968). A course rewarding independent behaviors had an emphasis on characteristics which were nondirective in nature:

> (a) ideas rather than facts; (b) seminar discussions, student presentations, or question-answer format; (c) no examinations or examinations involving essay questions; (d) little concern for attendance; (e) little explicit emphasis on discipline and adherence to school regulations; (f) no homework assignments or assignments demanding divergent thinking; (g) variety

> of presentation, as indicated by visual aids, tape recordings, outside speakers, or other material; (h) little direct overlap between class discussion and text content; (i) suggested readings, or assigned readings; (j) grade determined by consultation with student or by global evaluation of student's performance. (Domino, 1968, p. 257)

On the other hand, a course rewarding conforming behavior had an emphasis on characteristics which were more similar to a directive approach:

> (a) memorizing of technical terms, definitions, poems, etc.; (b) presentations of material through lectures; (c) objective type exams; (d) keeping of attendance records; (e) discipline and adherence to regulations; (f) clearly defined and frequent homework assignments emphasizing convergent thinking; (g) rare use of visual aids, outside speakers, little variation in class routine; (h) close correspondence between lecture material and textbook; (i) course grades determined by proportional weighting of various course requirements. (Domino, 1968, p. 257)

From a subject pool of 348 undergraduates who had been administered the Ai and Ac scales, Domino (1968) established four groups of 22 students each--High Ai-High Ac, High Ai-Low Ac, Low Ai-High Ac, Low Ai-Low Ac. The groups were also matched on verbal ability and sex. All of the instructors of the 88 students in their first two years of college were then interviewed and classified as rewarding independence or conformity in their teaching style according to the aforementioned criteria. Course grades received were sorted according to the teaching style. High Ai-Low Ac students received higher grades from teachers who rewarded independence while Low Ai-High Ac students earned higher grades from teachers who rewarded conformity.

Domino (1971) experimentally substantiated the previously found interactive relationship and extended it to student ratings of teacher effectiveness. From an initial subject pool of approximately 900 introductory psychology students, 50 High Ai-Low Ac and 50 Low Ai-High Ac students were selected. Each group of 50 was subdivided into two groups of 25 which had approximately equal sex composition, math ability, and verbal ability. One group of High Ai-Low Ac students and one group of Low Ai-High Ac students were taught in a directive manner and one group of High Ai-Low Ac students and one group of Low Ai-High Ac students were taught in a nondirective manner. One instructor taught all four sections but neither the instructor nor the students were aware that the four sections had been constructed in any unusual way. There were significant interaction effects in the expected direction between achievement orientation and teaching style for final course grades assigned by the instructor, for scores on a factual multiple-choice test of course content, for factual knowledge ratings of essays on the final examination, and for student ratings of teacher effectiveness.

Peterson's research (1977, 1979), cited earlier in the section dealing with anxiety, also furnished some support for Domino's findings. Of Peterson's four instructional treatments--high structure-low participation, low structure-high participation, high structure-high participation, and low structure-low participation, the

first two resemble directiveness and nondirectiveness, respectively. In the 1977 study, high school students were randomly assigned to four different sections of a 10-day social studies unit on alienation and were administered a number of aptitude and outcome instruments. One teacher was trained to put each of these styles into practice and then conducted each of the four sections with a different style. With a multiple-choice test given immediately after the unit as the dependent variable, there was a significant disordinal interaction. The directive treatment was best for High Ac-Low Ai students while the nondirective treatment was somewhat better for Low Ac-High Ai students. The results were similar when scores on a delayed multiple-choice test and an essay test were used as the criteria, although the interaction effect faded somewhat on the delayed measure. No ATI effects were statistically significant with attitude as the criterion.

In Peterson's (1979) study, four undergraduate educational psychology classes were taught for five weeks by one teacher according to the four prescriptions used in the 1977 study. On an essay test, High Ai students did best and Low Ai students did worst with the nondirective treatment. On a multiple-choice test, "college students high on Ai did better in low structure treatments, and college students low on Ai did better in high structure treatments" (p. 529).

In this report, Peterson also did further analysis of the 1977 data. Ai and Ac scores were treated separately and

the following relationships emerged. On the essay test, High Ai students did best with nondirective teaching and worst with directive teaching while Low Ai students exhibited the converse pattern. On the multiple-choice test, High Ac students did best with directive teaching but Low Ac students did equally poorly with directive and nondirective teaching.

The findings of Porteus (1976) also lend some credence to the Domino theory. Private secondary school students (N = 56) were assigned to either directive or nondirective 2-term courses in educational philosophy and economics. All sections were taught by the same teacher. An aptitude battery which included the Ai and Ac scales was administered and factor analyzed into four orthogonal factors, two of which were named "Ai" and "Ac". According to Snow (1976, p. 61), "the expansion of the Ai and Ac constructs by the additional components does not seem to have changed their meaning appreciably." Three achievement tests were spaced across the course; an essay task was also appended to the third test. Significant ATI effects surfaced only in the economics sections. Mirroring Domino's findings, High Ai-Low Ac students did better on the second test with nondirective instruction while Low Ai-High Ac students did better on the same test with directive instruction. A similar interaction effect was apparent in the education sections with the second test as the dependent variable but it was statistically nonsignificant. All other interaction effects

were either contrary to expectations or nonsignificant. In evaluating the degree of support for Domino's position, one should keep in mind the extremely small sample on which Porteus's analyses were performed.

The respective definitions of Ai and Ac rather clearly imply that High Ai-Low Ac students should gain more from nondirective teaching while Low Ai-High Ac students should benefit more from directive teaching. The research of Domino (1968; 1971) strongly supports such an expectation, particularly in regard to performance. The work of Peterson (1977, 1979) also supports the general hypothesis insofar as performance is concerned and some evidence for the interactive relationship was found in Porteus's (1976) study even though there were grave shortcomings in sample size and the Ai and Ac factor measures were contaminated with other variables. In regard to satisfaction, Domino (1971) presents supportive evidence. By and large, though, the research findings support the existence of a disordinal interaction effect in the expected direction, the support being much stronger with performance than with satisfaction as the criterion.

Interactions involving locus of control

The locus of control construct developed by Rotter (Rotter, Seeman, & Liverant, 1962) distinguishes between persons according to their views of how reinforcers are mediated. Simply speaking, individuals differ in the degree to which they see what happens to them as being under

internal or external control. Tendencies toward internal or external control are assumed to develop through the individual's unique history of interpreting the outcomes of his own actions. Lefcourt (1966) reiterated the formal definition:

> Internal control refers to the perception of positive and/or negative events as being a consequence of one's own actions and thereby under personal control; external control refers to the perception of positive and/or negative events as being unrelated to one's own behaviors in certain situations and thereby beyond personal control. (p. 207)

A fairly direct test of the hypothesis that student locus of control and teacher directiveness are interactively related to both academic performance and satisfaction was carried out by Parent, Forward, Canter, and Mohling (1975). One teacher utilized a "high discipline" (high structure) method and a "low discipline" (low structure) method to teach two sections of a miniature computer programming course of two hours duration to introductory psychology students:

> In the high discipline condition, the teacher laid down rules concerning not talking in class, not smoking, and not leaving the room without permission (strictness). Also, the teacher went through each step to be learned at a fairly rapid pace and administered brief tests at regular intervals (structure, pressure, pace). The conduct of the teacher was formal and aloof (formality).
>
> In the low discipline condition, students were handed booklets of all material and quizzes used in the other condition and told to work at their own pace and on their own time. The teacher relaxed at the desk, went to answer questions, and generally displayed a great deal of informality. There were no rules concerning smoking, talking, or leaving the room. (p. 767)

Parent et al. did not operationally define locus of control as the student's total score on the Internal-External Control Scale (Rotter et al., 1962) but instead used the total score on the "personal control subscale" items designated by Gurin, Gurin, Lao, and Beattie (1969). Grades on a test of course content and scores on a course satisfaction rating scale served as dependent variables. Locus of control and teaching condition were interactively related to achievement but not to satisfaction. As predicted, internal students earned higher grades in the nondirective class and external students earned higher grades in the directive class. The interaction was clearly disordinal. It should be noted that the 20 intermediate scorers on the locus of control measure were excluded from the analyses and that the significant disordinal interaction emerged using only 43 students.

Other researchers have used total scores on the Internal-External Control Scale and found support for predicted interactions involving student performance. Using a 2 X 2 experimental design, Daniels and Stevens (1976) found that internals scored higher on a multiple choice achievement test at the end of an 8-week introductory psychology course when taught with a relatively unstructured contract for grade approach, while externals scored higher when they were taught with a traditional teacher-centered approach.

Golden (1972), using fifth graders in a concept formation experiment, found that externals were more successful than internals when the teaching-learning situation was more structured. On the other hand, internals did poorer with additional structure.

Sanders (1978) experimentally tested the general hypothesis at the undergraduate level with both performance and satisfaction as criteria. Students were randomly assigned to either a teacher-centered or a student-centered class taught by the same instructor. Course satisfaction and achievement were assessed after three weeks of teaching. No main effects were significant and no interactive relationship emerged in regard to academic performance. There was, however, a highly significant disordinal interaction in the expected direction when satisfaction was the outcome variable. Internals were more satisfied with student-centered teaching; externals were more satisfied with teacher-centered teaching.

The results of the Sanders study are based on only 53 subjects and this is far short of the 200 subjects that Cronbach and Snow (1977, p. 46) recommend for such an experiment in order to ensure adequate power. Given the apparent lack of power, it is quite surprising and encouraging that a strong interaction effect surfaced with satisfaction as the criterion. For the same reason, doubt is cast on the appropriateness of accepting the null hypothesis regarding performance in the population.

Arlin (1975) was specifically interested only in satisfaction as a criterion within the present context. Arlin hypothesized that pupil locus of control interacts with the degree of structure in the classroom in relation to pupil satisfaction with classroom experiences. To Arlin, "structure" refers to teacher directiveness and decision making. Arlin measured locus of control with a scale constructed by Crandall, Katkovsky, and Crandall (1965) specifically for use in school settings where expectancy focuses on the control of reinforcement of activities related to intellectual achievement. Using a large sample of pupils in Grades 4, 6, and 8 in traditional and open classrooms, it was found that internal pupils were more satisfied in less structured classrooms while external pupils were not particularly affected by the degree of structure. The ordinal interaction effect was more pronounced for males than for females. It appears that the interaction effect may not have been significant for females but no specific statistical tests were applied to the male and female subsamples.

Rich and Bush (1978) employed a novel research design to assess the influence of high and low faculty control and student locus of control on instructional evaluation. "Faculty control" appears to be similar to directiveness:

> High faculty control style was evidenced when the instructor lectured, directed, or provided information more than 60 percent of the class period. Low faculty control was evidenced when the classroom student group verbally or physically participated, either

> independently or student-student more than 60 percent of the class period. (pp. 194-195)

Six small classes of upper undergraduates and graduate students in special education were each taught for approximately eight weeks. A highly structured approach was used in the first week. Less and less structure was used in subsequent weeks so that in the fourth week the approach was highly unstructured. The cycle was repeated for the second half of the course. Students rated each day's class on seven evaluative items. Only the first and last weeks of a cycle were used in the analysis. There were no main effects on total evaluative scores for teaching style or locus of control but there was a significant disordinal interaction in the predicted direction. This result parallels the finding of Sanders (1978) even though, as in the Sander's experiment, the number of subjects (N = 57) was markedly insufficient. It should also be pointed out that although Arlin (1975) appeared to demonstrate ATI effects only for males, 53 of the 57 students in the Rich and Bush study were females.

A study by Faytinger (1978) also suggests at least an ordinal interaction between teacher directiveness and locus of control in relation to student satisfaction. However, the report is unclear in regard to both the statistical analysis employed and the conclusions reached. Rotter's scale and a satisfaction measure were administered to 97 undergraduate and graduate students in two directively taught accounting courses and two nondirectively taught management courses.

According to the cryptic report, "as predicted, the interaction for the participatory environment (the management classes) and internal control showed a positive effect on satisfaction ($\underline{b}^* = .39$, $\underline{p} < .05$, $\underline{R}^2 = .120$)" (p. 1070). No further description of the analysis or findings is given. It appears that the degree of locus of control was positively related to satisfaction in the nondirective classes and unrelated to satisfaction in the directive classes, but caution should be exercised in accepting such a conclusion.

Each of the preceding studies offers some support for an interactive relationship between student locus of control and teacher directiveness in regard to either performance or satisfaction. It appears that internal students benefit from nondirective teaching and external students benefit from directive teaching. Daniels and Stevens (1976) and Golden (1972) tested and found support for the interaction effect in relation to performance; Arlin (1975) and Rich and Bush (1978) tested and found support for the interaction effect in relation to satisfaction. The findings of Faytinger (1978) also suggest an interaction in regard to satisfaction. Of the two studies which tested the interaction effect in relation to both criteria, Parent et al. (1975) found evidence for the interaction only with performance as the dependent variable, while Sanders (1978) found evidence for the interaction only with satisfaction as the criterion. Given that the foregoing studies used three

different locus of control measures, students from the early elementary to the graduate school level, and in several instances an insufficient number of subjects, the results are fairly consistent.

Interactions involving independence-dependence

"Independence" refers to the tendency to be self-reliant and not subordinate to the opinions of others in making decisions and forming ideas and opinions. Edward's (1959) "need for autonomy" appears to be very similar to the general notion of independence. It is defined as a manifest need to:

> be able to come and go as desired, to say what one thinks about things, to be independent of others in making decisions, to feel free to do what one wants, to do things that are unconventional, to avoid situations where one is expected to conform, to do things without regard to what others may think, to criticize those in positions of authority, to avoid responsibilities and obligations. (p. 11)

Most investigators have speculated that the dependent student is put more at ease when faced with the clearer demands of directive teaching and independent students have usually been expected to be more productive and satisfied in nondirective classrooms (Cronbach & Snow, 1977, p. 466). In line with such expectations, Patton (1955) and Harmon (1978) found that independent students learned more with nondirective teaching and Wallen and Wodtke (1963) reported that able-independent pupils learned more with permissive teachers while dull-dependent pupils learned more when taught by cold and controlled teachers. In Patton's study,

students who tended to be independent of authority also had the most favourable attitudes toward nondirective teaching. Wispe (1951) too reported that independent students expressed a desire for permissive teaching and Pascal (1973) found that autonomous students chose independent study over lecture teaching. In a study which utilized cluster analytic strategies, Mann (1969) concluded that "anxious-dependent" students preferred a teacher-centered classroom. Of course, one must be cautious in interpreting the findings of Mann and of Wallen and Wodtke since independence-dependence was confounded with anxiety and intelligence, respectively.

In contrast to other investigators, Amidon and Flanders (1961; 1963) and Flanders (1965) hypothesized that dependent students would do better in nondirective classes while independent students would profit from directive classes. They argued that expending energy to conform to teacher demands distracts the dependent student from applying his full intellectual capacities to task-related activities.

Amidon and Flanders exposed independent and dependent children to a short geometry lesson taught by the same teacher using either a "direct" or an "indirect" teaching style. In the direct condition, the teacher lectured, gave his own opinions and facts, gave directions, and criticized the pupils. In the indirect condition, the teacher gave encouragement and praise, clarified and developed ideas suggested by the students, asked many questions, and allowed for a great deal of student talk. As anticipated, the

indirect condition was inferior for independent students and superior for dependent students in terms of achievement. Flanders (1965), however, did further work on the same hypothesis and concluded that no interaction effect had, in fact, been reliably demonstrated. Nevertheless, Anderson (1960) also found that dependent students preferred an ideal teacher who was less directive than that preferred by independent students.

The sum of the evidence seems to favor the hypothesis that directive teaching is more suitable for dependent students while nondirective teaching is more suitable for independent students. If the conclusions of Flanders (1965) are accepted, then only the results of Anderson (1960) are in opposition to this interactive pattern. There also seems to be a tendency toward steeper regression slopes in regard to independent students than in regard to dependent students (e.g., Harmon, 1978; Pascal, 1973; Patton, 1955; Wallen & Wodtke, 1963; Wispe, 1951). Only Wallen and Wodtke (1963) and Mann (1969) have reported significant relationships for dependent students. This bias applies to both dependent variables, achievement and satisfaction.

Interactions involving extraversion-introversion

The extraversion-introversion dimension of personality (e.g., Eysenck, 1970) refers to styles of dealing with the social environment. In novel social situations, extraverts tend to take the initiative in seeking out people and demonstrate an able, friendly interpersonal manner;

introverts tend to withdraw from rather than approach people and to display anxiety and marked shyness. Extraversion-introversion has also been referred to simply as the "sociability" dimension (e.g., Guilford & Zimmerman, 1949).

It has usually been argued that extraverts should perform better in nondirective classrooms because there is more opportunity for "socializing" while introverts should perform better in more directive classrooms because such open interpersonal encounters are discouraged. It is also thought that the higher degree of verbal interaction in nondirective approaches creates anxiety in the introverts which interferes with learning and, almost by definition, is dissatisfying. Limited support for this interactive pattern has been found.

Bannister (1974) has carried out the only test of the interaction hypothesis at the secondary school level. The extraversion-introversion tendencies of 247 students in advanced algebra were assessed with the Maudsley Personality Inventory (Eysenck, 1962). There was a traditional and an innovative program at the school and Bannister tested the interaction in both programs. From each program, 42 students were selected so that there were 14 introverts, 14 ambiverts, and 14 extraverts. Through matched random assignment, 21 students were taught with a teacher dominant method and 21 students were taught with a student dominant method for 18 weeks in each program. One teacher taught all

four classes. Scores on a standardized mathematics achievement test served as the criterion. There were no main effects but, as predicted, extraverts tended to perform better ($p < .10$) in the student dominant classes. The effects may well have been attenuated because of the small number of students in the study.

Beach (1960) sought support for the interactive relationship at the advanced undergraduate level. Educational psychology students ($N = 98$) were assigned to four different sections of a semester-long child psychology course taught by different instructors. In one section, a traditional lecture method was employed; in another, a student-centered discussion group method was used; in another, autonomous small groups which established their own procedures were created; and in another, individual students worked independently. All students did have a common study guide, text, and reading list. Extraversion-introversion was gaged with the Sociability scale of Guilford's Inventory of Factors STDCR (Guilford, 1940) and the criterion was achievement gain scores on course content. Introverts did best in the lecture and the student-centered discussion group section, extraverts did best in the autonomous small group section, and there was no difference in the performance of introverts and extraverts in the independent study section. Although there appears to be some support for an interaction between student extraversion-introversion and the degree of directiveness, the results remain equivocal.

With an average of fewer than 25 students in each section and an idiosyncratic analysis, the outcome of the experiment is difficult to evaluate, as Cronbach and Snow (1977, p. 472) have already pointed out.

In Doty's (1967) study, introductory psychology students were exposed to a 2-week unit on physiological psychology using either a conventional lecture, a taped lecture, or a small-group discussion method. Extraversion-introversion was tapped with the Sociability scale of the Guilford-Zimmerman Temperament Survey (Guilford & Zimmerman, 1949). Performance was measured with a multiple-choice test based on course content; satisfaction was assessed with an attitude scale of favourability toward the section at the end of the treatment period. The taped lecture condition can be ignored in this review. Doty found that extraversion was positively related to achievement for both sexes in both the conventional lecture and the small-group discussion condition but the relationship was markedly more accentuated in the latter condition. In contrast, favourability and extraversion were more positively related in the lecture condition than in the small-group discussion condition. In fact, the correlation for females in the small group discussion condition did not even approach significance. It should be noted that Doty's report contains neither mean scores nor significance tests of differences between correlation coefficients. The analysis relied entirely on separate correlations for each

sex within each condition, a technique which is not particularly powerful.

In a large-scale study of teaching styles and pupil progress in English primary schools, Bennett (1976) concluded that extraverts achieved at a higher level in nondirective classrooms while introverts showed superior performance in directive classrooms. Bennett also reported that extraverted children found a less structured classroom to be more satisfying. It should be kept in mind that Bennett did not test these interactions per se. For analysis, teachers and students who had been administered a number of measures were clustered into several teacher and student groups which contained members similar on a number of variables. Combinations of teacher and student groups were then compared in terms of performance and satisfaction criteria. Since the pupil groups also varied on several other dimensions besides extraversion, the degree to which extraversion was a central component in the interactive relationships must remain somewhat a matter of speculation. The teacher groups did seem to vary on the directiveness continuum.

It appears that the only published research which has failed to find any evidence of an interactive relationship between extraversion-introversion and teacher directiveness is that carried out by Pascal (1973). Short written descriptions of an independent study, a lecture, and a lecture-discussion section of a psychology course on

socialization were given to 185 college students and they were asked to indicate their section preference. Preference was not related to scores on the Social Extraversion scale of the Omnibus Personality Inventory (Heist & Yonge, 1968).

Although the results of the research on the interactive relationship of student extraversion-introversion and teacher directiveness are suggestive of a reliable interactive pattern, no single study presents unequivocal evidence for a full-blown disordinal interactive pattern. In regard to achievement, Beach's (1960) findings seem to offer support but the analytical method is weak; Bannister's (1974) results are nonsignificant but nevertheless in the appropriate direction; Doty (1967) offers weak support for an ordinal interaction effect; Bennett's (1976) results support the existence of a disordinal interactive relationship in the appropriate direction but it cannot be conclusively ascertained whether extraversion-introversion per se is the crucial variable in the interactive relationship. In regard to satisfaction, the evidence for an interactive relationship is even weaker. While Pascal (1973) found no sign of an interactive pattern, Bennett (1976) found some support for an ordinal interaction effect, "extraverts" being more satisfied in nondirective classrooms. More well-planned research is clearly necessary before the existence of a disordinal interaction involving student extraversion-introversion can be soundly accepted or rejected.

A composite picture

The results of research on the interactive relationships of teacher directiveness and student personological variables to achievement and satisfaction are by no means entirely consistent but despite the fact that samples were drawn from diverse populations, that instructional treatments classified as directive or nondirective no doubt varied a great deal from study to study, that different measures were sometimes used to tap the "same" construct, and that research methods and data analyses were often insufficient, most studies did find evidence for disordinal or ordinal interaction effects in the anticipated direction.

If one is permitted to make generalizations in the interest of obtaining a global picture, composite profiles can be constructed of students most apt to benefit in terms of achievement and satisfaction from directive teaching and of students most likely to profit from nondirective teaching. As a whole, directive teaching seems to be most beneficial for students who tend to be authoritarian, dogmatic, anxious, compulsive, dependent, introverted, more oriented to achievement-via-conformance than to achievement-via-independence, more oriented to external than to internal control, and less achievement oriented, less intelligent, of lower conceptual level, and of lower divergent ability than their peers who are more suited to nondirective approaches. In contrast, students who profit

more from nondirective teaching tend to be nonauthoritarian, nondogmatic, nonanxious, noncompulsive, independent, extraverted, more oriented to achievement-via-independence than to achievement-via-conformance, more oriented to internal than to external control, and more achievement oriented, more intelligent, of higher conceptual level, and of higher divergent ability than their peers who are more suited to directive approaches.

C. Rationale for the Present Study

ATI applications and the basic researcher

Most of the research cited in this review was carried out with an eye to its potential usefulness in formulating empirically based matching models for teacher and student characteristics. Matching students with teachers who employ a teaching style which is conducive to their own higher productivity and morale is in line with the liberal ideal of a formal education system which is ultimately individualized for each student. Homogeneous grouping based on achievement or intelligence test scores has been more or less common practice for a long time, and the skilled teacher does try to the best of his or her ability to individuate instruction on the basis of intuitive judgements of student's personal needs. If it can be argued that every student should be given ample opportunity to achieve to the utmost of his or her potential and at the same time feel reasonably satisfied with his or her educational experience, then a matching

model which enhances the possibility of achieving these aims would seem to be worthwhile.

Instruction simply cannot be meaningfully individualized without some underlying notion of ATI and attribute information is of no use in individualizing instruction unless there is an ATI effect (Cronbach, 1967). Clearly, "all attempts at individualizing instruction rest explicitly or implicitly on hypothesized ATI" (Snow, 1976, p. 54). Individualized instruction can be thought of as the practical utilization of principles derived from empirical inquiry under the ATI rubric (Rhetts, 1972).

Some researchers have argued that a matching model of teacher and student characteristics designed to optimize achievement and satisfaction does so at the expense of personality and character growth, which should be a major goal of education. According to this alternative view, students with "undesirable" characteristics should be exposed to teachers and teaching styles that are likely to promote positive change in these characteristics (Harvey, Hunt, & Schroder, 1961; Hunt, 1971). For example, conceptual system theory, the forerunner of the conceptual level theory, is close to what might be referred to as a stage theory of authoritarian tendencies and to encourage stage progression it has been reasoned that a System I student should be taught by a System II teacher, a System II student by a System III teacher, and a System III and a System IV student by a System IV teacher (Harvey, 1970).

Both approaches to matching have potential drawbacks. For example, matching to foster productivity and/or satisfaction in one circumstance may result in an amplification of personological differences which is unintentional and eventually leads to differential success in other circumstances (Carroll, 1967). In essence, if different students are taught with different methods which play to their optimal mode of performing, it is not unreasonable to expect that the capacities of their optimal mode will be enriched while their less than optimal modes will be somewhat impoverished, and hence, when faced with a later circumstance which depends upon their less than optimal modes, they will experience a relative productivity and/or satifaction decrement. Perhaps Carroll's original example will suffice to elucidate the issue:

> Suppose we follow Gagne's proposal...that the addition of signed numbers be taught using either spatial, verbal, or symbolic concepts.... A child who has been taught spatially will have a concept of signed numbers different from the concept attained by a child taught with a purely verbal procedure, and even though the children may have the same score on a performance test, the differences might show up in dramatic form when the two children start to study some more advanced form of mathematics, say higher algebra....Using verbal spatial, or symbolic teaching methods might have the effect of making some children highly verbal, others highly spatial, and others highly symbolic in their thinking. The achievement of fixed, common goals may be attained, if this is true, only at the cost of <u>differential</u> achievement of other goals. (p. 43)

Matching to promote positive change or growth, on the other hand, would give what some would consider an unfair advantage in terms of potential for performance and

satisfaction to those who are already the most developed on the particular personality variable being used for matching, or perhaps more fittingly, "mismatching". For instance, in the previously mentioned matching model of teacher and student conceptual systems, only the System IV student would be "matched" with the teacher's conceptual system and therefore able to benefit from this compatibility in terms of performance and satisfaction. In the case of a personological variable such as locus of control, most would agree that what is desirable to be developed is an internal rather than an external locus of control. Therefore, it is unlikely that many would suggest matching a student with an internal locus of control with a directive teacher in order to develop an external locus of control. The implication is that all students should be taught by a nondirective teacher. Consequently, only the student with an internal locus of control would be in a position to maximize his productivity and satisfaction as a result of having a good fit with the teaching style. Incidentally, the preceding examples also indicate that there would be no room for System I or directive teachers in the educational system.

The research cited in the present review is clearly more useful for those advocating a matching model than for those favouring a mismatching model, since these ATI studies have used achievement and satisfaction as criterion variables. Those promoting a mismatching model should be more concerned with personality change as a criterion

variable. Nevertheless, it would be useful for mismatch theorists to have knowledge of the interactive relationships of teaching style and student personological variables to performance and satisfaction so that the potential benefits of mismatching models for personality growth may not be seriously undermined by potential decrements in performance and satisfaction.

Awareness of some degree of rationale for both a matching and a mismatching model has resulted in researchers being ambivalent when stating the implications of their research on the interaction of teacher and student characteristics for applications in the educational setting (e.g., Arlin, 1975; Domino, 1971; Hall, 1970).

Gehlbach (1979) has put forth an alternative tack for the application of ATI findings and methodology. Instead of utilizing the existence of strong interaction effects to create matching models, Gehlbach proposes that interaction effects can signal relatively weak instructional treatments which should be corrected so that their effects are more equitable across individual differences. Gehlbach promotes the eradication of steep attribute-treatment regressions in order to "remove instructional processes from the list of social forces that maintain inequalities of opportunity and achievement in our society" (p. 12). From his perspective, the objective is to develop instructional strategies that produce outcomes which are not systematically related to standings on individual difference dimensions, without

allowing the mean level of the outcome to decrease.

Perhaps the greatest value in ATI research lies simply in its potential to shed light on the instructional process. This value is inherent whether one embraces the instructional philosophy of the matching theorists, or the mismatching theorists, or of Gehlbach. The generalizations gained from jointly taking into account organismic and environmental variables relevant to educational outcomes can no doubt add to the insight and perhaps change the perspective of those actively involved in the educative task.

After an extensive review of the ATI literature, Cronbach and Snow (1977, p. 492) concluded that "no Aptitude x Treatment interactions are so well confirmed that they can be used directly as guides to instruction" and "that formal models of placement are primarily important as heuristics which place the informal practices of the schools in a new light" (p. 106). The benefits which might accrue from matching or mismatching on selected variables are unpredictable since many attribute variables and treatment factors may be interactively related to the outcome in question. It is theoretically possible to modify treatment variables until they are representative of a pure factor, even though such modifications might significantly decrease the potency of the instructional treatment. However, the personality of the student must inevitably remain multidimensional and even single dimensions are relatively

impervious to agents of change, either external or internal. Personological multidimensionality makes matching and mismatching "slippery" notions (Cronbach & Snow, 1977, p. 452).

The problems in practicing matching and mismatching would also appear to be inherent in regard to Gehlbach's alternative application of ATI findings. "AT correction" for differential benefits to students at opposite ends of one personological continuum might result in ATI effects in regard to another personological dimension. New ATI effects might surface with successive AT corrections and the AT corrections themselves might significantly decrease the potency of the instructional treatments. A decrement in potency to the point where the average performance across individual differences is lower than the average performance before the initiation of corrective actions would run counter to Gehlbach's initial intentions, and would certainly be looked upon unfavourably by most people.

It should be clear that whichever route for application is taken, matching, mismatching, or AT correction, the role of the basic researcher in ATI work remains the same: To carry out an open quest for interactive relationships between instructional variations and student differences and educationally relevant outcome variables, and, to elaborate theories in an endeavour to describe and explain in a coherent manner the interrelationships of these interactions. The basic researcher should not be concerned

with the "proper" application of his findings. As Kerlinger (1977) puts it:

> Studying relations and taking actions are on two different levels of discourse which one cannot easily bridge. Scientific research never has the purpose of solving human or social problems, making decisions and taking action. The basic researcher is preoccupied with, and should be preoccupied with, variables and their relationships. (p. 6)

The findings of basic ATI research within a given context may have, will probably have, implications for the effects of applications within that context, but that is a different matter.

The principle of parsimony

Whatever the ultimate aim of the ATI researcher may be, to simply promote the elaboration of instructional theory, to aid in the eradication of attribute-treatment regressions, or to facilitate the construction of workable matching models, the most economical of alternative interpretations for ATI findings is preferable. Indeed, adherence to the principle of parsimony is central to the <u>whole</u> process of systematic inquiry:

> The purpose of inquiry is to search out and present some unifying <u>organization</u> among disparate objects or events--not necessarily a very simple organization but an order or a pattern that is at least simpler than the total set of objects or events.... This goal of finding concepts that simplify our understanding of experience is commonly called the principle of parsimony or, Occam's razor. (Runkel & McGrath, 1972 , p. 282)

Researchers working on the interactive relationships of teacher directiveness and student personological variables have, of course, been properly concerned with the most

parsimonious interpretation of data within particular studies and even, to a lesser degree, with the most parsimonious interpretation of the findings of studies within particular personological domains. Little attempt has been made, however, to apply the principle of parsimony across personological domains. Cronbach and Snow (1977) have tried to develop a somewhat more global picture by subsuming some variables under the "defensive motivation" and "constructive motivation" umbrellas but the attempt has only been made at the informal interpretive level.

Occam's razor has not been allowed to cut across personological domains essentially because very few studies have attended to more than one personological dimension, and only a fraction of that number has considered the dimensions simultaneously at the data analytic level. Most theoretical and empirical work in the area is carried out with one or perhaps two personological variables in relative isolation. "Teaching style and student personality are multivariate, and future studies will have to go beyond testing relations of variables taken singly," as Cronbach and Snow (1977 , p. 471) clearly remind the reader.

The problem of overlapping interactions

The present research is concerned with the particular multivariate configuration of student variables within the present ATI context and how acknowledgement of their intercorrelative nature may lead to a reduction in the number of personological variables which are necessarily

viewed as operative. When the correlations among personological variables are taken into account, fewer than 12 first-order interactive relationships may account for effectively the same magnitude of the variance in achievement and satisfaction as the 12 interactive relationships combined. There may be redundancy in the interactive relationships; a number of the interactions may account for approximately the same portion of the variance in the criterion variables.

Consider an example of the problem of overlapping interactions in ATI research. Dogmatism has been found to be correlated with authoritarianism (Kerlinger & Rokeach, 1966), intelligence (Zagona & Zurcher, 1965), divergent ability (Rouff, 1975), conceptual level (Schroder, Driver, & Streufert, 1967), anxiety (Vacchiano, Strauss, & Schiffman, 1968), locus of control (Everly, 1975), and independence (Gordon, 1971). There is some evidence that each of these variables is involved in an interactive relationship with teacher directiveness when satisfaction is the dependent variable. It is conceivable that the primary interactive relationship concerns student dogmatism and that each of the other interactive relationships attains statistical significance only because each of the other personological variables is correlated with dogmatism. McCann and Fisher (1977), for instance, found that both student dogmatism and intelligence interacted with perceived teacher directiveness in regard to student satisfaction. However, multiple

regression strategies revealed that the interaction of student dogmatism and perceived teacher directiveness could account for the interaction of student intelligence and perceived teacher directiveness but, conversely, the interactive relationship involving intelligence could not explain the interactive relationship involving dogmatism. The primary interactive relationship, the interactive relationship that afforded the most parsimonious explanation, in this case appeared to have dogmatism rather than intelligence at its core. Further research might dislose that one of the other related personological variables is more aptly viewed as being involved in the primary interactive relationship, or, that there are two or three or more first-order interactions involving these particular student variables and perceived teacher directiveness which can account for unique variance in satisfaction.

A somewhat less than exhaustive search of the literature has revealed that there is a rather high degree of moderate intercorrelation among the 12 variables which have been found to interact with teacher directiveness. Table 1 contains examples of studies which have reported significant relationships between variables. It appears that each of the 12 variables is significantly related to no less than four and as many as nine of the other 11 variables.

To see how redundancy in interactive relationships can result from correlations among the variables which enter

Table 1

Examples of Studies Reporting Relationships Between Personological Variables

Authoritarianism and:
- Dogmatism (Kerlinger & Rokeach, 1966)
- Intelligence (Jacobson & Rettig, 1959)
- Convergent-divergent abilities (Abraham, 1972)
- Conceptual level (Schroder, Driver, & Streufert, 1967)
- Anxiety (Fehr & Heintzelman, 1977)
- Compulsivity (Rogers & Wright, 1975)
- Locus of control (Zuckerman & Gerbasi, 1975)
- Independence-dependence (Gordon, 1971)

Dogmatism and:
- Authoritarianism (Kerlinger & Rokeach, 1966)
- Intelligence (Zagona & Zurcher, 1965)
- Convergent-divergent abilities (Rouff, 1975)
- Conceptual level (Schroder, Driver, & Streufert, 1967)
- Anxiety (Vacchiano, Strauss, & Schiffman, 1968)
- Locus of control (Everly, 1975)
- Independence-dependence (Gordon, 1971)

Intelligence and:
- Authoritarianism (Jacobson & Rettig, 1959)
- Dogmatism (Zagona & Zurcher, 1965)
- Convergent-divergent abilities (Cline, Richards, & Needham, 1963)
- Conceptual level (Cross, 1966)
- Achievement orientation (Gough, 1975)
- Independence-dependence (Flanders, Anderson, & Amidon, 1960)
- Extraversion-introversion (Lynn & Gordon, 1961)

Convergent-divergent abilities and:
- Authoritarianism (Abraham, 1972)
- Dogmatism (Rouff, 1975)
- Intelligence (Cline, Richards, & Needham, 1963)
- Anxiety (Vidler, 1972)
- Achievement motivation (Doty, 1967)
- Locus of control (Dickinson, 1975)
- Independence-dependence (DeMartino, 1971)
- Extraversion-introversion (Goyal, 1972)

Conceptual level and:
- Authoritarianism (Schroder, Driver, & Streufert, 1967)

Dogmatism (Schroder, Driver, & Streufert, 1967)
Intelligence (Cross, 1966)
Locus of control (Hunt & Hardt, 1967)

Anxiety and:
Authoritarianism (Fehr & Heintzelman, 1977)
Dogmatism (Vaachiano, Strauss, & Schiffman, 1968)
Intelligence (Sarason, Hill, & Zimbardo, 1964)
Convergent-divergent abilities (Vidler, 1972)
Compulsivity (Brackbill & Little, 1954)
Locus of control (Butterfield, 1964)
Achievement orientation (Peterson, 1976)
Extraversion-introversion (Eysenck, 1970)

Compulsivity and:
Authoritarianism (Rogers & Wright, 1975)
Anxiety (Brackbill & Little, 1954)
Locus of control (Patton & Freitag, 1977)
Independence-dependence (Navran, 1954)

Achievement motivation and:
Convergent-divergent abilities (Doty, 1967)
Locus of control (Crandall, Katkovsky,
& Crandall, 1965)
Achievement orientation (Skolnik, 1966)
Extraversion-introversion (Doty, 1967)

Locus of control and:
Authoritarianism (Zuckerman & Gerbasi, 1975)
Dogmatism (Everly, 1975)
Intelligence (Ollendick & Ollendick, 1976)
Convergent-divergent abilities (Dickinson, 1975)
Conceptual level (Hunt & Hardt, 1967)
Anxiety (Butterfield, 1964)
Compulsivity (Patton & Freitag, 1977)
Achievement motivation (Crandall, Katkovsky,
& Crandall, 1965)
Achievement orientation (Gough, 1974)

Achievement orientation and:
Intelligence (Gough, 1975)
Anxiety (Peterson, 1976)
Achievement motivation (Skolnik, 1966)
Locus of control (Gough, 1974)

Independence-dependence and:
Authoritarianism (Gordon, 1971)
Dogmatism (Gordon, 1971)
Intelligence (Flanders, Anderson, & Amidon, 1960)
Convergent-divergent abilities (DeMartino, 1971)
Compulsivity (Navran, 1954)

Extraversion-introversion and:

Intelligence (Lynn & Gordon, 1961)
Convergent-divergent abilities (Goyal, 1972)
Anxiety (Eysenck, 1970)
Achievement motivation (Doty, 1967)

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into the interactive relationships, it is helpful to view interactions from the multiple regression perspective (McCann, 1981). In the multiple regression framework, the interaction of Variable A and Variable B is carried by the product of Variable A and Variable B. If the product is entered into a regression equation directly after the two independent variables, the significance of the amount of additional variance accounted for in the dependent variable indicates whether or not there is a significant linear interaction between the two independent variables (Cohen, 1968; Cohen & Cohen, 1975). It should be emphasized that the product term carries the interaction information but the interaction is not the product itself (Cohen, 1978). Generally, Variable A and Variable B will each be linearly correlated with the product. The product only becomes the interaction when Variable A and Variable B have been partialled from it (Cohen & Cohen, 1975, p. 295). A valid regression equation can also be formed which includes any number of individual predictors and their products as long as the constituents of the products precede the products in which they are involved (Cohen & Cohen, 1975, p. 324).

Suppose that Variable C also interacts with Variable A to account for a significant proportion of the variance in

the criterion. That is, Variable A X Variable C can be held responsible for a significant increment in the variance accounted for in the criterion when it is added to the regression equation directly after Variable A and Variable C. Further suppose that the five variables (i.e., Variable A, Variable B, Variable C, Variable A X Variable B, Variable A X Variable C) are entered into a regresssion equation using a hierarchical solution in the following order: Variable A; Variable B; Variable C; Variable A X Variable B; Variable A X Variable C. The results will be dramatically different depending upon whether Variable B and Variable C are independent or correlated.

If there is no correlation between Variable B and Variable C, the product terms that carry the two interactions can still be correlated because they have Variable A in common. However, when Variable A is partialled from Variable A X Variable B and from Variable A X Variable C, and Variable B is partialled from Variable A X Variable B, and Variable C is partialled from Variable A X Variable C, and Variable A X Variable B is partialled from Variable A X Variable C, the partialled Variable A X Variable C will still account for as much unique variance in the dependent variable as each of the product terms would contribute in separate 3-term equations. When there is no correlation between two predictors, there is no redundancy in the interactions of the two predictors with a third predictor. Clearly, the two product terms are carrying different

interactions.

If the correlation between Variable B and Variable C is very high, the product terms will be highly correlated. Since the product terms will be vying for roughly the same portion of the criterion variance, most of the increment will be attributed to the first product term to enter the equation and the increment left over to be uniquely attributed to Variable A X Variable C will be small and quite probably nonsignificant. Hypothetically, it is easy to see that if Variable B and Variable C are perfectly correlated, Variable A X Variable B will account for all of the variance which had formerly been attributed to Variable A X Variable C in the 3-term equation. This circumstance is hypothetical only in the sense that a multiple regression solution cannot be carried out with predictors which are perfect linear combinations of other predictors. It should be clear that if there is a moderate correlation between Variable B and Variable C, there will be a moderate degree of overlap in the interaction of Variable A and Variable B and the interaction of Variable A and Variable C. In this case, the interaction of Variable A and Variable B will be significant and the interaction of Variable A and Variable C may or may not remain significant. The argument for the redundancy of interactive relationships with correlated predictors, and for the independence of interactive relationships with uncorrelated predictors, can be extended to the case of three or more predictors.

A stepwise regression solution for overlapping interactions

It should be apparent from the foregoing discussion of the redundancy of interactive relationships with correlated predictors that the particular interactions that surface with a meaningful magnitude, or at least at an appropriately significant level, depend in part upon the order in which the product terms enter the regression equation. Theoretical deduction is the most satisfying basis for deciding the entry order. Sometimes a causal structure among predictors can be hypothesized on logical or temporal grounds to account for the correlations among predictors. Predictors can then be forced to enter the regression equation according to their hypothesized causal priority (Cohen & Cohen, 1975, p. 99, p. 116; West & Theobald, 1981). However, within the present context, as is often the case, no suitable theory is available for stipulating an entry order.

In the absence of <u>a priori</u> formulations, a stepwise regression procedure is recommended for determining the order of entry of variables into a regression equation (Darlington, 1968; Draper & Smith, 1966; Myers, 1979). The stepwise procedure adds predictors to the equation according to their incremental predictive merit. The first variable to enter is the one that is most highly correlated with the criterion. The second variable to enter is the predictor among the remaining predictors which makes the greatest increment in the variance accounted for in the criterion when the relationships among the variables already in the

equation are considered. On each step, the predictor that makes the largest increment in $\underline{R}^2$ is added to the equation. This process continues until the size of the increment is nonsignificant or is below some minimum magnitude set by the analyst. At each step, each predictor already in the equation is also tested to see if it still contributes significantly to the variance in the dependent variable when entered after each added predictor. If it does not, it is deleted. The stepwise regression procedure "defines an a posteriori order based solely on the relative uniqueness of the variables in the sample at hand" (Cohen & Cohen, 1975, p. 102).

The usual stepwise procedure is not suitable for ATI research but Cronbach and Snow (1977, p. 71) put forth an abridged stepwise plan which enables one to ask directly which variable or which composite of variables interacts most strongly with a set of treatments. The conventional stepwise procedure allows the predictors that contribute most to $\underline{R}^2$ to enter the regression equation first but these may not be the predictors that interact to the highest degree. In the abridged procedure all of the variables from which the product variables are created are forced to enter the regression equation on the first step and the stepwise selection mode operates for the individual fitting of product terms. The process is terminated when one of these interaction effects fails to attain an acceptable level of significance or fails to account for a sufficient magnitude

of the variance, as determined by the researcher.

The general use of stepwise regression has been censured on several grounds. However, it appears that some of the criticisms do not pertain in the present context and that some others can be overcome, or at least minimized. For example, consider the following criticism:

> When the competing IVs are substantially correlated with each other, the problem is likely to be compounded, since the losers in the competition may not make a sufficiently large unique contribution to be entered at any subsequent step before the problem is terminated by "nonsignificance." (Cohen & Cohen, 1975, p. 103)

In the present research problem, the predictors are probably more "moderately" than "substantially" correlated but the main point to be made is that the usually undesirable act of having all but one of correlated predictors eliminated from the regression equation is in fact in line with the goal of the present research.

Another problem with stepwise regression is that:

> in many research problems, the ad hoc order produced from a set of IVs in one sample is likely not to be found in other samples from the same population. When among the variables competing for entry at any given step, there are trivial differences among their partial relationships with Y, the computer will dutifully choose the largest for addition at that step. In other samples, and, more important, in the population, such differences may well be reversed. (Cohen & Cohen, 1975, p. 103)

For the purposes of the present research, the goal is to select only one of two or more interactive relationships if differences between their partial relationships with the criterion are indeed <u>trivial</u>. If their differences are

trivial in the initial sample then one can only assume that they will also be trivial in the population. It also can only be assumed that the order of magnitude of the product predictors' capacities over a number of samples will remain the same or, at the most, will not favour one product predictor or the other. The goal of the present endeavour is parsimony; if there are only trivial but perhaps reversible differences among the predictive capacities of product predictors, then selecting one or the other will serve the research objectives.

Cohen and Cohen (1975) argue that the gravest shortcoming in stepwise regression surfaces when a relatively large number of predictors are employed:

> Since the significance test of an IV's contribution to $\underline{R}^2$ proceeds in ignorance of the large number of other such tests being performed at the same time for the other competing IVs, there can be very serious capitalization on chance. The result is that neither the statistical significance tests for each variable nor the overall tests on the multiple $\underline{R}^2$ at each step are valid. (p.103)

Twelve initial predictors is not usually considered to be an overly large number in a stepwise regression analysis but there is still appreciable room for "serious capitalization on chance." Nevertheless, in the proposed research, the deleterious opportunities for chance are somewhat reduced because a fair degree of substantive knowledge has been used to select the 12 product variables. The approach is not of the "shotgun" variety. Few tests of true null hypotheses are likely to be made among the variables competing for entry.

In any case, the bias is in the direction of committing a Type I error rather than committing a Type II error and if error must occur, it is less damaging to have too many interaction terms in the final equation rather than too few, in the present context. As far as the problem of the inflated $\underline{R}^2$ is concerned, the difficultly is not associated with stepwise regression per se but occurs "whenever a subset of IVs has been selected post hoc from a larger set of potential variables on the basis of their relationships with Y" (Cohen & Cohen, 1975, p. 107).

Cohen and Cohen (1975, p. 104) do point out that their "distrust of stepwise regression is not absolute, and decreases to the extent that the following conditions obtain": the research goal is primarily predictive and only secondarily explanatory, an ample predictor to sample size is maintained, and conclusions remain tentative until the regression equation has been cross-validated.

What are the fruits of a mathematical model constructed on regression principles? Draper and Smith (1966) are especially articulate in expressing "what one is left with":

> We have now obtained an empirical model that can be used for predictive purposes. Created in a somewhat arbitrary fashion it makes no claim to explain why response responds to variation in the independent variables but merely provides an empirical explanation of the data that may be useful in future work. (p. 226)

> When the functional model is very complex... one can often obtain a linear predictive model which, though it may be in some senses unrealistic, at least reproduces the main features of the behavior of the response under study. These predictive models are very useful and under certain conditions can lead to real

> insight into the process or problem....These problems are usually referred to as 'problems with messy data'--that is, data in which much intercorrelation exists....If nothing else, it can and does provide guidelines for further experimentation, it pinpoints important variables and it is a very useful variable screening device. (p. 235)

In the present research, it was anticipated that a free stepwise regression analysis of the 12 interactive relationships of student personological variables and perceived teacher directiveness for each of the criterion variables would allow a lesser number of interactive relationships to emerge, weighted according to how much unique variance they can account for in the dependent variables. In line with the benefits of a regression model as stated by Draper and Smith, it was hoped that within this particular ATI context, the resultant regression equations may give some idea of the combined magnitude of the interaction effects, may pinpoint a suitable set of important personological variables, may provide guidelines for further research, may be useful for predictive purposes in future work, may eventually lead to insight into the processes involved, and may serve as bases on which to evaluate the variance accounting capacities of any new personological variables whch might be suggested to be important. In general, it was hoped that the regression models might facilitate theory building and simplify applications, or at least thoughts about applications.

D. Rationale for Using Individual Perceptions of Teacher Directiveness

Years ago, Koffka (1935) articulated a distinction between the objective and the subjective environment and discussed in some detail the importance of the distinction for a successful psychology. He referred to the objective physical and social environment in which the person is enveloped as the "geographical environment"; he referred to the environment as it is perceived and reacted to by the person as the "behavioral environment". Simply stated, the geographical environment is the "actual" environment and the behavioral environment is the "perceived" environment.

Koffka believed that behavior is strongly influenced by the behavioral environment, a view held by several others (e.g., Lewin, 1936; Murray, 1938; Rotter, 1954), and is only indirectly and imperfectly related to the geographical environment, depending upon the degree of correspondence between the geographical and the behavioral environment of the acting individual. Since the behavioral environment is the cognitively processed geographical environment, the observation of the behavioral environment is exclusive to the behaving person. Idiosyncratic alterations, deletions, and additions may result in a behavioral environment which bears little resemblance to the geographical environment or to the behavioral environments of other persons acting within essentially the same geographical environment.

It is apparent that perception is central to the tenets of Gestalt psychology and is the essential core of cognitive functioning (Koffka, 1935). Unique individual mental images, which may often be very similar across individuals exposed to a common geographical environment, not only represent the content of phenomenal experience but also predispose and direct actions in respect to the geographical environment.

If it was the case that we see what we see because things are what they are, perception would pose few problems. For all intents and purposes the geographical environment could be substituted for the behavioral environment since the behavioral environment would be equivalent for all persons within the same geographical environment. Perception might then be looked upon as a constant across individuals, a link in the initiation and execution of responses but of no use in explaining variability in behavioral differences across individuals within the same geographical environment. But to assume a one-to-one correspondence between the behavioral environment and the geographical environment is to be naive:

> To the unitiated, one with a background neither in psychology nor in classical philosophy, perceiving may pose no problems. The simple view, sometimes called naive realism, would hold that there are objects and events in the external world and that somehow representations of these, called Eidola by the pre-Socratic philosophers, emanate from things in the world and find their way into the nervous system and eventually into consciousness. Such, however, is not the case save in the most metaphoric sense. (Bruner, 1958, p. 85)

Ittelson (Ittelson, 1973; Ittelson, Proshansky, Rivlin, & Winkel, 1974) has made a distinction between object perception and environmental perception. "Object perception" refers to the traditional brand of perception studied in experimental psychology and is concerned with the perception of discrete objects. Research on visual illusions falls into this category. On the other hand, "environmental perception" refers to the perception of the environment as a unitary field rather than to the perception of discrete objects within the environment. Perception takes on a broader meaning which encompasses all forms of environmental awareness and pertains not only to descriptive responses but also to responses of a more evaluative nature. Ittelson has also emphasized that environmental perception is in large part a social phenomenon since other people are so often a part of the environment to which the person is responding.

It seems fairly clear that there is much more opportunity for the manifestation of cross-individual variation in environmental perception than in object perception. Given the complex and ambiguous nature of "an environment", the observer is forced into paying more attention to some cues rather than others and subsequently acts in accord with these observations. Hastorf, Schneider, and Polefka (1970) express a similar view in respect to person perception:

> the perceiver plays a dominant role in selecting the characteristics of other people to be observed (and described). He does not passively record the attributes of the other person, but selects and organizes his perceptions in terms of categories which are particularly useful to him. (p. 13)

The extent of commonality of behavioral environments of different persons in the presence of the same geographical environment is in part dependent upon the degree of congruency of the past experiences of the different persons. Experiential history is always unique and the structure and meaning of an environment is derived and fabricated from the person's experiential scope, which is itself the result of many previous cognitive derivations and fabrications. It appears compellingly evident that environmental perception is influenced not only by environmental stimuli but also by personological factors (Bruner, 1958; Schalling, 1977), which reflect differences in experiential histories, whether these personological factors have been formally delineated or not. That subjection to "environments which differ in significant ways will lead to perceivers who perceive in significantly different ways" (Ittelson, 1973, p. 9) seems axiomatic.

Lewin (1936) used the term "psychological life space" to refer to the entirety of facts which determine the behavior of an person at a given point in time. Behavior is thought to be the result of the interaction of personological and perceived environmental factors. Lewin's now familiar formula $B = f(P,E)$ means that behavior (B) is a function (f) of the interaction of personological factors

(P) and the perceived environment (E) of the individual. The formula itself is widely recognized and is accepted as the proper symbolic representation of the mechanistic, linear, codeterminational, unidirectional notion of interaction usually employed in ATI research, but the specification of "E" as the perceived environment is not so generally appreciated. Most proponents of the interactionistic approach recognize Lewin as the father of the paradigm but fail to follow his conceptualization of environmental factors.

Although the overwhelming majority of ATI studies still rely on actual environment conceptualizations, several researchers have underlined the importance of individual perceptions in classroom studies (e.g., Brown, 1978; Cronbach & Snow, 1977; Schultz, 1979; Wallberg, 1976) and have promoted the use of perceived environment measures in interactional research (e.g., Cronbach & Snow, 1977; Golding, 1977; Magnusson, 1974; Magnusson & Endler, 1977; Schultz, 1979). Cronbach and Snow (1977, p. 471) have stressed that future "studies will have to reckon with the evidence that the student's perception mediates the interaction and generates personality-dependent ATI effects even where the teacher is 'constant'" and that "the student's perceptions of his teacher may be just as significant a source of interaction as the teacher's actual style" (p. 508).

The ATI approach is by its very nature a cognitive model of human functioning but the significance of this fact has not been sufficiently explored and there has been little discussion of the implications of the cognitivistic nature of the interactional paradigm for the conceptualization and measurement of treatments. Indeed, it is questionable whether the cognitive nature of ATI research is even yet widely recognized:

> The meaning of ATI research is sometimes not fully appreciated. There is a fundamental difference between a conventional input-output study, such as a study of the effects of lectures versus discussions and an aptitude-treatment interaction study of learning from instruction. The difference goes beyond the search for significant F-ratios for interactions. An ATI approach is a cognitive model. It implies that an understanding of the learners' cognitive and affective processes, such as their aptitudes, is important if we want to understand how people learn from instruction. (Wittrock, 1979, p. 8)

It would seem that coherent ATI theory may be more adequately developed if the conceptualization and categorization of treatments is compatible with the underlying cognitive theoretical position of ATI research (McCann & Stewin, 1980).

The cognitive orientation in psychology owes more in an historical sense to the Gestalt tradition than to any other school in psychology. Cognitivists emphasize cognitive processes in the explanation of behavior and perception is the core of cognitive processing. The Gestalt influence on the centrality of perception in the cognitivistic approach is apparent in Buss's definition:

> The "pure" cognitive position may be characterized by E = f(P), that is, the environment or situation is constructed by the person via certain cognitive processes and structures. In this view, the focus is upon the means by which an individual cognizes his/her world, rather than upon behavior per se, where the meaning of a situation is determined by what is in the organism. (Buss, 1977, p. 196)

Shaw and Costanzo (1970) also point out the uniting theme in cognitivistic interpretations of the perceptual process:

> The common thread running through the views expressed by the various cognitive theorists is that perception is not merely the passive reception and automatic interpretation of stimuli, but rather it is an active process in which the incoming data are selectively related to the existing cognitive structure. It is the relationship of the inputs (sensory data) to the organization of cognitive elements (cognitive structure) that determines and gives meaning to the thing perceived. The details of this perceptual process are viewed differently by different theorists, but there seems to be relatively good agreement concerning the general nature of the process. (p.178)

If treatments are so powerful (Mischel, 1973) that there are no differences in treatment perception between subjects exposed to the same treatment but there are clear differences in treatment perception between subjects exposed to different treatments, then it would not seem to matter whether measures of the actual treatment or the perceived treatment are employed. The actual and the perceived treatment are effectively isomorphic. However, if there are significant differences between subjects within the same treatment, then perceived and actual measures of the treatment are not congruent and using measures of the actual environment ignores the centrality of perception in the cognitivistic position and obscures the fundamental interaction involving organismic variables and aspects of

the behavioral environment. Unless the objective environment and the subjective environment are effectively congruent for each subject in a study it would appear that perceived environment measures, tabulated as individual phenomenological accounts of the environment, are necessary to preserve the integrity of the cognitivistic position.

Individual perceptions of the degree of teacher directiveness do appear to vary significantly from the actual level of teacher directiveness. For example, Tuckman (1968) found that perceived teacher directiveness was only related to one of four trained observer measures of directiveness and that the interrater reliability of the SPOTS scale was not particularly high. King (1976) found that perceived teacher directiveness only accounted for about 25% of the variance in teachers' perceptions of their own degrees of directiveness. McCann and Fisher (1977) similarly found that perceived teacher directiveness accounted for about 25% of the variance in the best estimates of actual teacher directiveness available, the mean SPOTS scale scores for each teacher. McCann and Fisher also found that the interactive relationships involving perceived teacher directiveness and authoritarianism and dogmatism remained significant when the variance which could be attributed to the best estimate of actual teacher directiveness was taken into account. Perhaps the most direct demonstration of the independence of perceived and actual teacher directiveness in ATI research has been put

forth by Dowaliby and Schumer (1973), who dealt with the mediating effects of student anxiety. In the first study, Dowaliby and Schumer found significant disordinal interactions but no treatment main effects. High anxiety students attained higher scores on two multiple-choice tests based on class content in a teacher-centered class than in a student-centered class while the converse occurred for low anxiety students. In the second study, students in an introductory educational psychology course responded halfway through the term to an anxiety scale and a scale designed to tap the perceived structure of the course, on which the student indicated the degree to which the course operated on a lecture or a discussion basis. Two course examinations were used as dependent variables. Surprisingly, when the extreme scorers on the perceived structure measure were retained for analysis, essentially the same disordinal interaction emerged as in the earlier manipulative study. That is, even though the teaching style was held constant, high anxiety students received higher grades when they perceived the course to be structured while low anxiety students did better when they perceived the course to be unstructured.

Given that a distinction can be made between the perceived and the actual environment, that it is the perceived environment which seems to be more directly related to behavior, that the perception of the environment is idiosyncratic, that the perception of the environment is

influenced not only by environmental stimuli but also by personological factors reflecting differences in experiential histories, that the ATI approach has an underlying cognitive theoretical orientation and the foregoing characteristics are central to the assumptions of cognitive psychology, that the perceived degree of teacher directiveness and the actual degree of teacher directiveness have been shown to vary, and that the perceived degree of teacher directiveness may enter into interactive relationships with student variables even when the actual degree of teacher directiveness is constant, it seemed appropriate that the present ATI study should employ individual perceptions of teacher directiveness rather than estimates of actual teacher directiveness as the unit of analysis.

II. Method

A. Subjects

Students enrolled in the nonvocational Grade 11 and 12 English courses of 12 male and 14 female teachers at four public schools located in a large urban centre and one public school situated in a satellite town took part in the study. Teachers and students were told that the study was concerned with teacher-student compatibility, that the data obtained were confidential and anonymous, and that participation was on a voluntary basis. All of the English teachers at the five schools opted to participate in the project and 445 students responded in at least one of the two testing sessions.

The initial intention was to use in-class testing and collect all of the data in one or two schools, using all of the students in all of the nonvocational English classes of all of the English teachers at the Grade 11 and 12 level. However, in-class testing could only be arranged at one school and that school only employed two English teachers at this grade level. Another school consented to having one of the two necessary testing sessions in-class and the other out-of-class. Unfortunately, many students did not appear for their out-of-class testing sessions. At the other three schools, both testing sessions were carried out on an out-of-class basis, with every second student being invited to participate. The overall student participation rate for

out-of-class sessions was lower than desired.

English was chosen because it can be adequately and comfortably taught using either a directive or a nondirective approach, because it is required of all students at these grade levels, and because "subject matter that seeks to communicate generalizations about human affairs (literature, social studies, philosophy, ecology, even psychology) is very little represented" in ATI research (Cronbach & Snow, 1977, p. 509).

B. Instruments

In addition to scales of perceived teacher directiveness and student satisfaction, 14 instruments were required to measure the personological constructs, excluding intelligence which was determined from school records. The choice of personological measures was influenced by a combination of the following factors: a desire to select the tests which possess the soundest psychometric properties, a desire to select the tests which have been successfully used within the present interactive context in the past, and a desire to employ tests which could be easily and quickly administered in a group testing situation.

Student Perception of Teacher Style (SPOTS) scale

The SPOTS scale was developed by Tuckman (1968) as a measure of teacher directiveness as perceived by the teacher's students. Essentially, the student rates the frequency or intensity of certain teacher behaviors on 17

9-point scales built around Tuckman's definition of directiveness and the responses to the items are summed or averaged to obtain the student's rating of the level of directiveness of the teacher. In Tuckman's usage of the scale, the mean student score for a class is taken as an index of the teacher's actual degree of directiveness. The lower the score the more directive the teacher is assumed to be.

Tuckman factor analyzed an earlier 32-item version of the SPOTS scale and found seven factors which "seemed to measure several closely related dimensions which centered around the formality, absolutism, and control of classroom activities" (pp. 50-51). Thirteen items which loaded on the first factor and also were significantly correlated with the total 32-item SPOTS scale score were combined with four items which were also related to the total score to form the 17-item version. It should be noted that the item-total correlations were computed using mean class scores on each item and mean class total scores. The class rather than the student was the unit of analysis.

Tuckman also calculated an index of interrater reliability. Each student was ranked according to the agreement of his SPOTS scale score with the mean SPOTS scale score for his class. These rankings were then correlated with the mean SPOTS scale scores for each of the 22 teachers in the sample. The correlations ranged from .95 for students ranked first to fourth to .69 for students ranked tenth.

There was little agreement for students below the tenth rank.

Since Tuckman's intention was to construct a scale that would accurately estimate actual teacher directiveness, the failure to find adequate correlations below the tenth rank is somewhat disconcerting. Disregarding the possibility of tied scores within a class, it appears that more than half the students in each class may have provided "inaccurate" estimates of teacher directiveness. Of course, this result is not damaging to the notion put forth in the present study that perceived teacher directiveness is somewhat independent of actual teacher directiveness.

An attempt was also undertaken in Tuckman's research to validate the SPOTS scale by correlating the mean SPOTS scale score for each teacher with two different indices on each of two trained observer measures. Only one of the four correlations was significant. Tuckman concluded "that typically the observers did not perceive teachers the same way the students did" (p. 48). Although this attempt to demonstrate concurrent validity was not highly successful, it does serve to underline the importance of a distinction between perceived and actual teacher directiveness.

The McCann and Fisher (1977) data have been used to further deduce the psychometric properties of the SPOTS scale with the person rather than the class as the unit of analysis. It was found that the corrected item-total correlations for 16 of the 17 items are significant and

range from .25 to .61. The Guttman split-half reliability is .78 and rises to .83 if the one item which did not correlate with the total SPOTS score is removed. A factor analysis yielded one large factor which accounts for 64.4% of the variance, and three smaller factors accounting for 17.2%, 10.3%, and 8.2% of the variance, respectively. The first factor appears to centre on the giving of directions, the second on the formality of the teacher, and the third on the structuring of student activity. The fourth factor had the highest loading on the one item which failed to correlate with the total SPOTS scale score.

The best estimate of actual directiveness in the McCann and Fisher research is the mean SPOTS scale score for each teacher. The correlation between the mean teacher scores and the individual SPOTS scale scores was .51. Therefore, the SPOTS scale scores appear to have a component which is related to the actual teacher style and a component which is independent of actual teacher directiveness. This is desirable and is in line with expectations. Given the theoretical link between actual and perceived environments espoused in the present research, it would be both unreasonable and undesirable if the individual responses were not at all related to differences in teaching style or were related to a much higher degree to differences in teaching style.

The original SPOTS scale has the following item format:

The students in your class

1 2 3	4 5 6	7 8 9
Only speak when the teacher asks them a question	Feel free to ask the teacher questions	Feel free to speak up at almost any time

Students are asked to select the one number which most accurately expresses their personal perceptions.

In discussing rating scales, Remmers (1963) has recommended that they have unbroken lines, that they have descriptive anchors which clearly pertain to a point on the line, and that the intervals between numbers be equidistant unless the adjacent numbers both have clearly defined anchors. The SPOTS scale items do not meet any of these criteria. Therefore, a new format for the SPOTS scale has been developed for the present study. In the new version, each item appears on a separate page and has an unbroken 15 centimeter vertical line numbered from 1 on the bottom to 9 on the top, with the original descriptive anchors clearly indicating 1, 5, and 9 on the line.

Student Satisfaction Scale (SSS)

The Student Satisfaction Scale (SSS) contains 10 bipolar items which are responded to on 9-point scales. Five of the items deal with satisfaction with the teacher and five deal with satisfaction with the course. The five teacher satisfaction items are identical to the five course satisfaction items except for the substitution of "teacher" for "course" (see Appendix A).

The factor structure and the reliability of the SSS have been determined by the author from the reponses of 248 students in Grade 10, 11, and 12 English classes. The SSS is unifactorial with all items having loadings of .77 to .89. The corrected item-total correlations range from .75 to .87 and the Guttman split-half reliability is .96. The psychometric characteristics of the SSS appear to merit its use as a general measure of satisfaction with the teacher and the course.

Modified version of the California F-Scale

Ezekiel and Athanasiou (Athanasiou, 1968; Ezekiel, 1970) developed a modified version of the F-Scale constructed by Adorno et al. (1950) to measure authoritarianism. This revised 6-point Likert scale corrects for response bias by using 14 of the original type of items and 14 reversed items, avoids the harsh quality of the items of the earlier F-Scale (Weiss et al., 1970), and has a test-retest reliability of .86 (Athanasiou, 1968). For present research purposes, two items from the revised version were excluded because they deal with "Americanism" and do not have the same connotations in Canada. One of the two deletions was a reversed item.

Shortened version of the Rokeach Dogmatism Scale

Rokeach (1960) developed the Dogmatism Scale to measure general authoritarianism. Since its introduction the 40-item Likert scale has been widely used in research. Rokeach reported reliabilities ranging from .68 to .93 using several

samples and a number of other researchers have attested to the measure's validity (Ehrlich & Lee, 1969; Hanson, 1970; Kerlinger & Rokeach, 1966; Plant, 1966; Thompson & Michel, 1972; Vaachiano, Strauss, & Hochman, 1969).

Troldahl and Powell (1965) developed a shortened version of the original instrument. The original 40-item scale was administered and the 20 items with the highest item-total correlations were retained. The coefficient for each of the 20 items was greater than .30. The resultant 20-item scale and the other 20 items were then administered to a second sample. The coefficient for each of the 20 selected items was again greater than .30. In the initial sample, the 20-item version correlated .95 with the original long scale and in the second sample the correlation was .94. The split-half reliability of the short-form scale was found to be .79.

Raven's Progressive Matrices

Raven's Progressive Matrices (Raven, 1956) is used to measure convergent ability. In each item, a matrix or design is presented which has a part removed. The respondent is required to select the design from a number of alternatives which will provide the missing part. A highly convergent response must be applied to progressively more difficult items.

Zussman (1976) used the last 36 items of the standard version of the test to assess convergent ability in a sample of secondary school students. He reported a test-retest

reliability of .88 with no significant change in performance over a 2-month period. Burke (1958) presents further information on the reliability and validity of the instrument and also points out that the test can be employed in a timed or untimed mode. In the present research, the last 36 items of the standard version were used and a time limit of 20 minutes was set to keep the total test battery administration time to a minimum.

Wallach and Kogan divergent tests

Wallach and Kogan (1965) developed five semi-projective tests containing from four to nine items each to assess divergent ability: Instances, Alternate Uses, Similarities, Pattern Meanings, and Line Meanings. Responses to items such as "Tell me all the ways in which a curtain and a rug are alike" and "Tell me all the different ways you could use a shoe" are scored according to their uniqueness and number. Although the tests were initially intended for the late elementary school level, they have been successfully employed with older samples (e.g., Zussman, 1976).

In an elementary school sample, Wallach and Kogan found that split-half reliabilities of the five tests ranged from .82 to .88 for uniqueness scores and that each test had a split-half reliability of .93 for number scores. Wallach and Kogan also found that item-total correlations were in the .70s and .80s for all tests except Instances. Zussman employed two items from each of the tests except Instances in a secondary school study. With a 3-month interval between

test administrations, he found reliabilities ranging from .73 to .92 with the median value being .86.

In the present research, one item from each test except Instances was administered. For each test, the item with the highest average uniqueness and number item-total correlations in Wallach and Kogan's data were chosen. The Alternate Uses item selected was "Tell me all the different ways you could use a shoe," with item-total correlations of .83 for uniqueness and .86 for number. The Similarities item was "Tell me all the ways in which a curtain and a rug are alike," with item-total correlations of .77 for uniqueness and .85 for number. The Pattern Meanings item selected was #5 (p. 34). Its item-total correlations were .80 for uniqueness and .85 for number. The Lines Meaning item chosen was #9 (p. 36). The item-total correlations for this item were .68 for uniqueness and .84 for number. In the present study, the number and uniqueness scores for each of the four items were standardized and averaged and the resultant mean number and uniqueness scores were standardized and combined to form a single divergent ability score which was itself subsequently converted to z-scores.

Although the authors of the tests do not recommend timed testing, 5 minutes was allowed for the completion of each item. Timed testing was considered necessary since the order of administration of the tests in the testing session was randomized and the other tests in the session were timed. In any case, the time limit in the present study

should not be viewed as restrictive. Zussman (1976) administered twice as many items within a 45-minute class period and considered that to be sufficient time to refer to it as untimed testing.

Paragraph Completion Method

The Paragraph Completion Method is a semi-projective method developed to index a person's position on the conceptual level dimension. The subject responds with at least three sentences to each of the following items:

(1)What I think about rules...

(2)When I am criticized...

(3)What I think about parents...

(4)When someone does not agree with me...

(5)When I am not sure...

(6)When I am told what to do...

A 2-minute time limit is set for each stem for persons 14 years of age and over.

Each response is scored according to guidelines set out in a manual by Hunt, Butler, Noy, and Rosser (1978). Responses are scored according to <u>how</u> the subject thinks. The person's total CL score is determined by averaging the three highest item scores. Hunt et al. (1978), using 10 samples of high school students, found the mean interrater reliability to be .84, with coefficients ranging from .74 to .91. In addition, 1-year test-retest reliability coefficients for three samples of high school students were .48, .56, and .53 (p. 44). Gardiner and Schroder (1972) also

report a test-retest reliability coefficient of .67 over a 3-month period for a college sample. Hunt et al. (1978) and Hunt (1971, pp. 38-42) also provide a great deal of information on the validity of the conceptual level measure.

Trait anxiety scale of the State-Trait Anxiety Inventory (STAI)

The STAI (Spielberger, Gorsuch, & Lushene, 1970) contains separate scales for assessing state and trait anxiety. Only the trait anxiety scale was used in the present research. It consists of 20 statements that ask the subject how he or she generally feels (e.g., "I feel that difficulties are piling up so that I cannot overcome them"; "I feel secure"; "I tire quickly"). The items are responded to on 4-point scales: almost never, sometimes, often, almost always.

Speilberger et al. report test-retest reliabilities of .84 for males and .76 for females over a 1-hour period, .86 for males and .76 for females over a 20-day period, and .73 for males and .77 for females over a 104-day period. Internal consistency coefficients are in the .80s and .90s. Extensive evidence of the validity of the measure is also reported.

Levitt (1967, pp. 71-72), after surveying several of the scales available to measure anxiety, concluded that "the STAI is the most carefully developed instrument, from both theoretical and methodological standpoints" and "the test construction procedures described... are highly

sophisticated and rigorous."

Compulsion scale

Comrey (1965) factor analyzed scores on a number of personological variables and isolated a "compulsion" factor with the following factor loadings: need for order (.72), love of routine (.62), drive to finish (.61), meticulousness (.55), cautiousness (.53), impulsiveness (-.37), and personal grooming (.35). On the basis of the results of the factor analysis, Comrey developed an 18-item compulsion scale. The items are responded to on a 9-point scale. The anchors are on a "never" to "always" continuum for 16 items and an "absolutely not" to "absolutely" for two items.

After the data for the present study were obtained, it was learned that Comrey (1970) had revised the original compulsion scale and renamed it the "orderliness vs lack of compulsion" scale. The newer measure has 20 items, 10 of which are reversed, but is very similar to the earlier version. Six of the items are identical on the two scales. Eight other items from the original scale appear in essence on the updated scale. Only four items on the first scale, which all deal with drive to finish a task, do not appear in any form on the 1970 version. The split-half reliability of the orderliness vs lack of compulsion scale is .92 (Comrey, 1970). Reasonable support for its construct validity was also obtained in a study by Comrey and Backer (1970).

Achievement scale of the Jackson Personality Research Form

A high scorer on the 20-item true-false Achievement scale of the Jackson Personality Research Form "aspires to accomplish difficult tasks; maintains high standards and is willing to work toward distant goals; responds positively to competition" and is "willing to put forth effort to attain excellence" (Jackson, 1967, p. 6). Form A of the test was used in the present research but several other more or less equivalent forms are available.

Jackson reports a 1-week test-retest reliability of .80 and a 2-week alternate form reliability of .73 for secondary school students. Jackson (pp. 23-25) also provides extensive data to support the convergent and discriminant validity of the scale. Clarke (1973) reviewed a number of achievement motivation measures and concluded that the Jackson Personality Research Form is the most reliable and the best validated test for assessing achievement motivation.

Achievement orientation scales of the California Psychological Inventory

The basic theme of the 38-item true-false Achievement-via-Conformance (Ac) scale is "one of a strong need for achievement coupled with a deeply internalized appreciation of structure and organization" (Megargee, 1972, p. 72). In contrast, the 32-item true-false Achievement-via-Independence (Ai) scale deals with need for achievement in settings where creativity, self-actualization, and independence of thought are rewarded

(Gough, 1968).

For the Ai scale, Gough (1975) found 1-year test-retest reliabilities of .57 and .63 for high school females and males, respectively, and a short-term (1-3 weeks) test-retest reliability of .81. Megargee (1972) also reports a split-half reliability for the Ai scale of .75. For the Ac scale, Gough (1975) reports 1-year test-retest reliabilities of .73 for high school females and .60 for high school males. Megargee (1972) reports a short-term (1-4 weeks) test-retest reliability of .81. Megargee also reports a corrected split-half reliability of .79 and internal consistency coefficients ranging from .54 to .94.

Since there is a strong need for achievement component in each scale, the correlation between the Ai scale and the Ac scale is .38 for females and .39 for males (Gough, 1968). Megargee (1972) presents a great deal of validity information pertaining to each of the scales.

In the present research, the two scales were administered in one booklet with the items interspersed as they are in the original test booklet. The total Ac scores and the total Ai scores were standardized and the Ac score was subtracted from the Ai score to form a relative Ai score.

Internal-External Control Scale

Rotter, Seeman, and Liverant (1962) developed the Internal-External Control Scale to measure locus of control or "individual differences in the generalized belief that a

person can control his own destiny," as Mirels (1970, p. 226) puts it. The instrument consists of 29 forced-choice items. Six of these items are filler items and were not used in the present research.

Rotter (1966) obtained an internal consistency coefficient of .70 in a sample of 400 college students. Rotter also retested college students one month after the initial administration and found a test-retest reliability of .72. Lefcourt (1966) and Rotter (1966) also furnish extensive information on the validity of the scale.

Autonomy and Succorance scales of the Jackson Personality Research Form

The Autonomy and Succorance scales of the Jackson Personality Research Form (Jackson, 1967) were utilized to measure independence-dependence. A high scorer on the 20-item true-false Autonomy scale can be described as independent, autonomous, self-determined, self-reliant, individualistic, undominated, nonconforming, resistant, uncompliant, free, unmanageable, rebellious, ungovernable, unconstrained, and lonewolf (p. 6). On the other hand, a high scorer on the 20-item true-false Succorance scale can be described as dependent, appealing for help, seeks support, entreating, ingratiating, trusting, wants advice, requesting, help-seeking, pleading, defenseless, needs protection, craves affection, confiding, and helpless (p. 7). Autonomy and Succorance load in opposite directions on the same factor as "measures of orientation towards

direction from other people" (pp. 4-5).

Jackson reports that odd-even reliabilities range from .69 to .78 for the Autonomy scale and from .78 to .85 for the Succorance scale. One-week test-retest reliabilities reported are .77 and .84, respectively. Extensive support is also given (pp. 23-25) for the convergent and discriminant validity of the two scales.

In the present research, the standardized Succorance score was subtracted from the standardized Autonomy score to form a relative independence-dependence score.

Extraversion scale of the Eysenck Personality Inventory

The Extraversion scale of Form A of the Eysenck Personality Inventory (Eysenck & Eysenck, 1968) contains 24 yes-no items which have been carefully selected to ascertain "the outgoing, uninhibited, impulsive and sociable inclinations of a person" (p. 5). Test-retest reliabilities of .82 for a 1-year interval and .97 for a 9-month interval are reported. Eysenck and Eysenck also report a split-half reliability of .75. Information on concurrent validity, validity by ratings and nominated groups, construct validity, and factorial validity is also provided.

Construction and format of the test booklets

Eleven test booklets were constructed and labelled A through K. Booklet A contained the SPOTS scale items and B the Compulsion Scale items. Booklet C was comprised of the Dogmatism Scale items and the F-Scale items interspersed in a random order. Booklet D contained the Eysenck Personality

Inventory extraversion items. Booklet E contained, also in a random order, the items of the Achievement, Autonomy, and Succorance scales of the Jackson Personality Research Form as well as the Achievement-via-Conformance and Achievement-via-Independence items of the California Psychological Inventory. Booklet F contained the Internal-External Control Scale items and G the State-Trait Anxiety Inventory trait anxiety items. Booklet H was comprised of the items of the Paragraph Completion Method, I the Student Satisfaction Scale items, J the Raven's Progressive Matrices items, and K the items of the Wallach and Kogan divergent tests. The responses to all of the test booklets except those containing the Wallach and Kogan divergent tests and the Paragraph Completion Method were recorded on computer answer sheets.

C. Procedure

Testing was carried out in late November and early December. It was felt important that the students had a sufficient length of time to become acclimatized to the classes so that their responses to the SPOTS scale and to the Student Satisfaction Scale would be more reliable and valid. It was also thought desirable to collect perceived directiveness and satisfaction data before grades were received, to rule out the possibility that grades obtained influenced perceptions of teacher behavior and satisfaction.

As mentioned earlier under the "Subjects" heading, both in-class and out-of-class testing were used to secure the data. In each case, two testing sessions were necessary--Session X and Session Y. Although the actual testing time for each session was approximately 60 minutes, an 80-minute block was set aside. Only the test administrator and the students were present.

Booklets A through G were administered in Session X and booklets H through K in Session Y. For each testing session, the order in which the test booklets were to be completed was randomly determined, the only restrictions being that booklet A was always second in Session X and booklet I was always second in Session Y. These restrictions were imposed so that the important student satisfaction and perceived directiveness measures were always completed at relatively the same period in a session and at a time when student attention to the tasks was probably near its peak. The order of the sessions was also alternated from one group to another. That is, one group of students participated in Session X first while the next group of students participated in Session Y first.

Out-of-class administrations were given to groups of 2 to 29 students in rooms designated for the purpose. Two administrations of Session X and two of Session Y were offered daily in alternating order for approximately one week at each school. Of course, in the one school where one session was completed in-class, the students were asked to

come to whichever session they had not completed in-class. Students selected their own time slots and received authorized excuse slips from the test administrator for missed classes.

Students were aware of a coding plan which ensured that their responses were anonymous and confidential. At the beginning of each testing session, respondents put their name on a removable label affixed to a Manila envelope. They were asked to put their English teacher's name, class name and number, and their sex on the face of the envelope but were asked not to put their name or any other identification on the test booklets or the answer sheets. At the end of each session they sealed the answer sheets in the envelope before handing it back to the test administrator. In March, as English grades and IQ scores were collected from school files and written on the face of one envelope, the name labels were removed from both sealed envelopes. Therefore, only sealed anonymous answer sheets were available to the author.

III. Results

In total, 445 students participated in at least one of the data collection sessions. The breakdown of the 445 respondents according to school, year in school, teacher sex, teacher, and student sex is displayed in Table 2. Based on all the data available, 28.9% of the students were in School A, 11.1% were in School B, 13.8% were in School C, 12.2% were in School D, and 34.1% were in School E ($\underline{N}$ = 443); 57.0% were in Grade 11 and 43% were in Grade 12 ($\underline{N}$ = 442); 14 of the 26 teachers were female and 64.7% of the students were drawn from the classes of female teachers ($\underline{N}$ = 442); 56.9% of the students were female ($\underline{N}$ = 443); 66.8% of the female students had female teachers ($\underline{N}$ = 442); and 62.0% of the male students had female teachers ($\underline{N}$ = 442).

Scores for each of the personological variables in the study, and the subscores from which some were derived, were computed and appear in Table 3. Mean item scores were used for authoritarianism, dogmatism, anxiety, compulsivity, achievement motivation, achievement-via-independence, achievement-via-conformance, locus of control, autonomy, succorance, and extraversion-introversion. Between 2.2% and 6.6% of the respondents failed to answer one or more items on these personological scales. For the authoritarianism and dogmatism scales, a failure to answer an item was scored as a "4" on the 7-point Likert system. For anxiety, compulsivity, achievement motivation, achievement-via-independence, achievement-via-conformance,

Table 2

Breakdown of the Total Sample[1] According to School, Grade, Teacher Sex, Teacher, and Student Sex

School	Grade 11 or 12	Teacher Sex	Teacher	Student Sex
A(128)	11(74)	Female(45)	#1(33)	Female(18)
				Male(15)
			#2(12)	Female(7)
				Male(5)
		Male(29)	#3(29)	Female(10)
				Male(19)
	12(54)	Male(54)	#4(54)	Female(27)
				Male(27)
B(49)	11(29)	Female(11)	#5(2)	Male(2)
			#6(9)	Female(5)
				Male(4)
		Male(18)	#7(14)	Female(9)
				Male(5)
			#8(4)	Female(4)
	12(20)	Female(10)	#5(6)	Female(5)
				Male(1)
			#6(4)	Male(4)
		Male(10)	#9(10)	Female(10)
C(60)	11(40)	Female(19)	#10(11)	Female(9)
				Male(2)
			#11(8)	Female(7)
				Male(7)
		Male(21)	#12(9)	Female(5)
				Male(4)
			#13(4)	Female(2)
				Male(2)
			#14(5)	Female(2)
				Male(3)
	12(20)	Female(20)	#15(8)	Female(5)
				Male(3)
			#10(1)	Male(1)
			#16(5)	Female(3)
				Male(2)
			#17(6)	Female(4)
				Male(2)
D(54)	11(34)	Female(23)	#18(10)	Female(4)
				Male(6)
			#19(13)	Female(11)
				Male(2)
		Male(9)	#20(9)	Female(3)
				Male(6)
			#18(14)	Female(3)
				Male(1)

			#19(1)	Male(1)
			#21(2)	Male(2)
		Male(15)	#22(9)	Female(7)
				Male(2)
			#23(1)	Female(1)
			#24(5)	Female(3)
				Male(2)
E(151)	11(77)	Female(77)	#25(30)	Female(19)
				Male(11)
			#26(47)	Female(26)
				Male(21)
	12(74)	Female(74)	#25(51)	Female(27)
				Male(24)
			#26(23)	Female(14)
				Male(9)

[1] Only 442 respondents are displayed in this table since three students failed to include information pertaining to one or more of the variables on which the breakdown was computed.

Table 3

Descriptive Statistics for the Personological Measures in the Study

Variable	M	SD	N
Authoritarianism[1]	3.63	.56	359
Dogmatism[1]	3.84	.66	359
Verbal intelligence	107.62	13.27	330
Quantitative intelligence	115.31	14.09	330
Intelligence	111.47	11.93	330
Convergent ability	26.60	5.75	387
Divergent ability Item #1 (number)	9.66	4.08	388
Divergent ability Item #2 (number)	8.17	3.67	388

Divergent ability Item #3 (number)	7.04	3.26	388
Divergent ability Item #4 (number)	9.51	4.61	388
Divergent ability Item #1 (uniqueness)	1.31	1.60	388
Divergent ability Item #2 (uniqueness)	.65	1.16	388
Divergent ability Item #3 (uniqueness)	2.25	1.91	388
Divergent ability Item #4 (uniqueness)	1.66	1.86	388
Divergent ability	.00	1.34	388
Relative convergent -divergent ability	.00	1.34	382
Conceptual level[1]	1.46	.33	390
Anxiety[1]	2.00	.44	356
Compulsivity[1]	5.78	1.06	356
Achievement motivation[1]	.60	.17	361
Achievement -via-independence[1]	.51	.13	360
Achievement -via-conformance[1]	.60	.12	361
Relative achievement -via-independence	.01	.97	360
Locus of control[1]	.46	.15	354
Autonomy[1]	.43	.16	361
Succorance[1]	.48	.19	360
Relative independence-dependence	.01	1.78	360
Extraversion introversion[1]	.57	.14	359

[1] Mean item score

locus of control, autonomy, succorance, and extraversion-introversion, the mean item score was based only on the items to which the student responded.

Canadian Lorge-Thorndike verbal and quantitative subscores (Lorge, Thorndike, & Hagen, 1967) were obtained from school records for 322 students. Verbal subscores were substituted for quantitative subscores for five additional students who lacked quantitative subscores. For three other students, the Otis-Lennon intelligence score (Otis & Lennon, 1969) was substituted for verbal and quantitative subscores. Scores for the remaining 115 students in the study were not available either because the students had withdrawn or changed schools, or because insufficient identification was provided by the student to find his or her name in the school files, or because the student had never been tested. The intelligence score used in the analyses was the mean of the verbal and the quantitative subscores. The correlation between the verbal and quantitative subscores was r (328) = .52, $p < .001$. The magnitude of this correlation may have been marginally deflated because of the 11 substitutions.

The convergent ability score was simply the number of correct answers on the Raven's Progressive Matrices test but the divergent ability score was more complex in its derivation. Each of the four divergent ability items selected from the Wallach and Kogan battery was scored for number and uniqueness and these number and uniqueness scores were each standardized. The means of the four z-scores for

number and the four z-scores for uniqueness were then computed and the two means standardized. The mean of the two standardized means was then computed and standardized to form a z-score for divergent ability. The divergent ability z-score was then subtracted from the standardized version of the convergent ability score to form the relative convergent-divergent ability score used in the analyses. Convergent and divergent ability correlated r (380) = .67, p < .001.

Responses to the Paragraph Completion Method test were scored for conceptual level by an expert scorer at the Ontario Instistute for Studies in Education who has been an associate for several years of Dr. David E. Hunt, the developer of the instrument.

Achievement-via-independence and achievement-via-conformance scores were standardized and the achievement-via-conformance z-scores were subtracted from the achievement-via-independence z-scores to form the relative achievement-via-independence scores used in the analyses. Achievement-via-independence and achievement-via-conformance correlated r (358) = .52, p < .001.

Similarly, succorance and autonomy scores were standardized and the succorance z-scores were subtracted from the autonomy z-scores to form the relative independence-dependence scores employed in the analyses. The succorance and autonomy scores correlated r (358) = -.61, p

< .001.

Of the 360 students who responded to the perceived teacher directiveness measure, the Student Perception of Teacher Style (SPOTS) scale, 1.1% failed to answer one or two of the 17 items. Each person's SPOTS score was the mean item response for the completed items. The mean of the SPOTS scores was 5.61 and the standard deviation was 1.04. SPOTS scores ranged from 2.18 to 8.06. Higher scores on the 9-point scale indicate a more nondirective teaching style.

To determine the extent to which perceived teacher directiveness scores varied across teachers, a 1-way analysis of variance was carried out using each teacher as a treatment and perceived teacher directiveness scores as the dependent variable (see Table 4). Mean teacher directiveness scores ranged from 4.41 to 7.45 and the amount of variance accounted for across teachers was substantial, $\underline{eta}^2 = .34$, $\underline{F}(24, 334) = 7.32$, $\underline{p} < .001$.

End of term English grades were recorded from school files in March. Final grades for 13.7% of the 445 students in the study could not be located. In many instances the student had withdrawn or changed schools; in other cases insufficient identification was provided by the student to reliably match the name on the questionnaire envelope to a name in the school records. Grades ranged from 21 to 95; the mean was 64.81 and the standard deviation was 11.24 ($\underline{N}$ = 384).

Table 4

Analysis of Variance for Perceived Teacher Directiveness Scores Across Teachers

Source	SS	df	MS	F
Between[1]	134.50	24	5.60	7.32*
Within	255.55	334	.77	

* $p < .001$

[1] One teacher for whom one student completed a SPOTS scale but failed to provide a teacher identification number has been excluded from this analysis.

Each of the 391 students who completed the Student Satisfaction Scale (SSS) responded to all of the items. A mean item score on the 9-point scale was calculated for each participant. The mean SSS score was 5.91, the standard deviation was 1.84, and the scores ranged from 1.1 to 9.0. Higher scores indicate a higher degree of satisfaction with the teacher and the course.

A data base ($N = 214$) was formed for the regression analyses which contained no missing scores for grades, satisfaction, perceived teacher directiveness, authoritarianism, dogmatism, intelligence, relative convergent-divergent ability, conceptual level, anxiety, compulsivity, achievement motivation, relative achievement-via-independence, locus of control, and relative

independence-dependence, and no missing data for school, year in school, teacher sex, teacher identification number, and student sex. The breakdown of the 214 students according to school, year in school, teacher sex, teacher, and student sex is displayed in Table 5. Based on an N of 214, 15.4% of the students were in School A, 7.9% were in School B, 16.8% were in School C, 16.4% were in School D, and 43.5% were in School E; 62.6% were in Grade 11 and 37.3% were in Grade 12; 11 of the 20 teachers were female and 74.8% of the students were drawn from the classes of female teachers; 64.0% of the students were female; 78.1% of the female students had female teachers and 71.4% of the male students had female teachers.

Descriptive statistics for the criteria, perceived teacher directiveness, and the student personological variables for the cases used in the regression analyses appear in Table 6.

The intercorrelations of grades, satisfaction, perceived teacher directiveness , and the student personological variables for the data used in the regression analyses are shown in Table 7. Note that the two criteria, grades and satisfaction, were independent, r (212) = .11, ns.

For the regression analyses to determine which variables indeed interacted with perceived teacher directiveness in relation to grades and satisfaction in the present study, seven sets of predictors were designated. Set

Table 5

Breakdown of the Common Data Base (N = 214) According to School, Grade, Teacher Sex, Teacher, and Student Sex

School	Grade Or 12	Teacher Sex	Teacher	Student Sex
A(33)	11(30)	Female(20)	#1(18)	Female(11)
				Male(7)
			#2(2)	Female(2)
		Male(10)	#3(10)	Female(2)
				Male(8)
	12(33)	Male(3)	#4(3)	Female(2)
				Male(1)
B(17)	11(9)	Female (1)	#5(1)	Male(1)
		Male (8)	#7(8)	Female(6)
				Male(2)
	12(8)	Female(1)	#5(1)	Female(1)
		Male(7)	#9(7)	Female(7)
C(36)	11(26)	Female(17)	#10(10)	Female(9)
				Male(1)
			#11(7)	Female(6)
				Male(1)
		Male(9)	#12(7)	Female(4)
				Male(3)
			#14(2)	Male(2)
	12(10)	Female(10)	#15(5)	Female(4)
				Male(1)
			#10(1)	Male(1)
			#17(4)	Female(2)
				Male(2)
D(35)	11(21)	Female(15)	#18(8)	Female(3)
				Male(5)
			#19(7)	Female(7)
		Male(6)	#20(6)	Female(2)
				Male(4)
	12(14)	Female(3)	#18(3)	Female(3)
		Male(11)	#22(7)	Female(6)
				Male(1)
			#24(4)	Female(2)
				Male(2)
E(93)	11(48)	Female(48)	#25(18)	Female(12)
				Male(6)
			#26(30)	Female(18)
				Male(12)
	12(45)	Female(45)	#25(34)	Female(19)
				Male(15)
			#26(11)	Female(9)
				Male(2)

Table 6

Descriptive Statistics for the Criteria, Perceived Teacher Directiveness, and the Student Personological Variables in the Regression Analyses (N = 214)

Variable	M	SD
Grades	65.33	10.71
Satisfaction	6.11	1.75
Perceived teacher directiveness	5.71	.96
Authoritarianism	3.63	.55
Dogmatism	3.82	.64
Intelligence	111.71	11.86
Relative convergent -divergent ability	-.07	1.46
Conceptual level	1.48	.33
Anxiety	2.00	.44
Compulsivity	5.79	.98
Achievement motivation	.60	.18
Relative achievement -via-independence	.00	.92
Locus of control	.46	.15
Relative independence -dependence	-.14	1.76
Extraversion -introversion	.57	.14

1, Set 2, Set 3, and Set 4 were considered as covariates. Set 1 contained four predictors carrying the information pertaining to the school which each student attended; Set 2 contained the information on whether the student was in Grade 11 or Grade 12; Set 3 was teacher sex; Set 4 was student sex. Set 5 was the student personological variable being tested. Set 6 was perceived teacher directiveness. Set 7 was the product of the student personological variable score and the perceived teacher directiveness score which carried the information pertaining to the interaction of the two variables.

The multiple regression program of the Statistical Package for the Social Sciences (SPSS) (Nie, Hull, Jenkens, Steinbrenner, & Bent, 1975) was used to perform the regression analyses. Although the program does not perform a true stepwise solution, without user interventions, but only a forward stepwise inclusion solution, it does have the advantage of being able to enter the variables or sets of variables into the equation in a user determined hierarchical fashion.

In the individual regression analyses, the hierarchy of entry directly reflected the set designations. Set 1 entered the equation first to control for differences in grades or satisfaction which could simply be attributed to attendance at different schools. Set 2 entered second to remove from the criterion any variance which could be attributed to being in Grade 11 or Grade 12 after the variance accounted

Table 7
Correlations Between Variables in the Regression Analyses
Using the Common Data Base (N = 214)

	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.
1.	1.00	.11	.13	-.25	.36	.51	.10	.27	-.10	.09	.22	.10	-.08	-.04	-.23
2.		1.00	.58	-.10	-.10	-.09	.01	.07	.05	.15	.16	.02	-.19	-.14	-.05
3.			1.00	-.19	-.20	.03	.16	-.05	-.04	.00	.09	.04	-.04	-.14	.03
4.				1.00	.38	-.14	-.09	-.23	.00	.21	-.06	-.20	-.09	-.06	-.01
5.					1.00	-.34	-.09	-.23	.14	.16	-.17	-.34	.06	-.10	.08
6.						1.00	.17	.22	-.13	-.25	.07	.15	.00	.08	.00
7.							1.00	-.05	-.11	-.03	-.01	.01	.02	.00	-.19
8.								1.00	-.13	.01	.25	.10	-.02	.07	-.02
9.									1.00	.06	-.10	.20	.14	-.19	-.11
10.										1.00	.24	-.34	-.15	-.17	-.22
11.											1.00	-.16	-.16	.15	-.07
12.												1.00	.07	.04	-.15
13.													1.00	.03	.02
14.														1.00	.02
15.															1.00

(1.) Grades (2.) Satisfaction (3.) Perceived teacher directiveness (4.) Authoritarianism (5.) Dogmatism (6.) Intelligence
(7.) Relative convergent-divergent ability (8.) Conceptual level (9.) Anxiety (10.) Compulsivity (11.) Achievement motivation
(12.) Relative achievement-via-independence (13.) Locus of control (14.) Relative independence-dependence
(15.) Extraversion-introversion

Note: $r > .14$, $p < .05$ $r > .19$, $p < .01$ $r > .22$, $p < .001$

for by school attended was partialed out. Set 3 entered third to control for any additional variance which could be ascribed to teacher sex. Set 4 entered fourth to remove any further variance in the dependent variable which could be linked to student sex after the effects of the first three sets were deleted. Set 5 and Set 6 entered fifth and sixth respectively but the order was arbitrarily picked simply to maintain order consistency across individual regressions. Set 7 entered last. The amount of variance accounted for by the product term after the predictors from which it was formed entered the equation indicated whether or not an interaction effect had occurred. The increment in the amount of variance accounted for after each set entered the regression equation was tested for significance using the incremental R^2 formula (Cohen, 1968, p. 435).

For each of the 12 personological dimensions considered in the study, the increments in the amount of variance accounted for in grades and satisfaction by the covariates as a group, the student variable in question, perceived teacher directiveness, and the interaction of perceived teacher directiveness and the student personological variable appear in Table 8.

With grades as the criterion, the covariates as a group accounted for 11.4% of the variance, F (7, 206) = 3.78, $p < .001$. School membership accounted for 5.38% of the variance, F (4, 209) = 2.97, $p < .05$. Being in Grade 11 or Grade 12 made only a nonsignificant increment of .39% in the variance

Table 8
Results of Individual Regressions to Test for the Contributions of the Covariates, the Student Variable, Perceived Teacher Directiveness, and the Interaction (N = 214)

Student Variable	Criterion	R^2 after Covariates	R^2 after Student Variable	R^2 after Perceived Directiveness	R^2 after Interaction
Authoritarianism	Grades	.114***	.151***	.151	.154
	Satisfaction	.112***	.116	.428***	.429
Dogmatism	Grades	.114***	.197***	.198	.199
	Satisfaction	.112***	.114	.429***	.430
Intelligence	Grades	.114***	.369***	.370	.371
	Satisfaction	.112***	.120	.435***	.435
Relative convergent-divergent ability	Grades	.114***	.118	.118	.120
	Satisfaction	.112***	.112	.435***	.441
Conceptual level	Grades	.114***	.170***	.172	.172
	Satisfaction	.112***	.113	.434***	.438
Anxiety	Grades	.114***	.131*	.131	.131
	Satisfaction	.112***	.112	.429***	.438
Compulsivity	Grades	.114***	.117	.117	.118
	Satisfaction	.112***	.129*	.447***	.449
Achievement motivation	Grades	.114***	.154***	.154	.171*
	Satisfaction	.112***	.125	.432***	.454**
Relative achievement-via-independence	Grades	.114***	.117	.117	.117
	Satisfaction	.112***	.114	.428***	.432
Locus of control	Grades	.114***	.128	.128	.131
	Satisfaction	.112***	.148***	.449***	.449
Relative independence-dependence	Grades	.114***	.114	.115	.123
	Satisfaction	.112***	.120	.429***	.433
Extraversion-introversion	Grades	.114***	.141*	.143	.143
	Satisfaction	.112***	.113	.435***	.436

* $p < .05$ ** $p < .01$ *** $p < .001$

accounted for, F (1, 208) = .85. Teacher sex accounted for an additional 3.03% of the variance, F (1, 207) = 6.87, p < .01, with male teachers giving somewhat higher grades than female teachers. Student sex, too, was responsible for a significant increment of 2.60% in the variance accounted for in grades, F (1, 206) = 6.04, p <.05, with male students receiving somewhat lower grades. Entering authoritarianism, dogmatism, intelligence, conceptual level, anxiety, achievement motivation, or extraversion-introversion, into the equation made a significant additional contribution to the variance accounted for in grades. The magnitude of the additional variance accounted for ranged from 1.7% , F (1, 205) = 3.92, p < .05, for anxiety to 25.5%, F (1, 205) = 82.81, p < .001, for intelligence. The addition of perceived teacher directiveness did not significantly increase the predictive capacity of any of the 12 regression equations.

With regard to interaction effects, only achievement motivation interacted with perceived teacher directiveness to make a significant increment of 1.7% in the variance accounted for in grades, F (1, 203) = 4.16, p < .05. The interaction is graphically displayed in Figure 1.

With satisfaction as the criterion, the covariates as a group accounted for 11.2% of the variance, F (7, 206) = 3.71, p < .001. School membership accounted for 6.71% of the variance, F (4, 209) = 3.74, p < .01. Being in Grade 11 or Grade 12 made only a nonsignificant increment of .22% in the variance accounted for, F (1, 208) = .49. Teacher sex

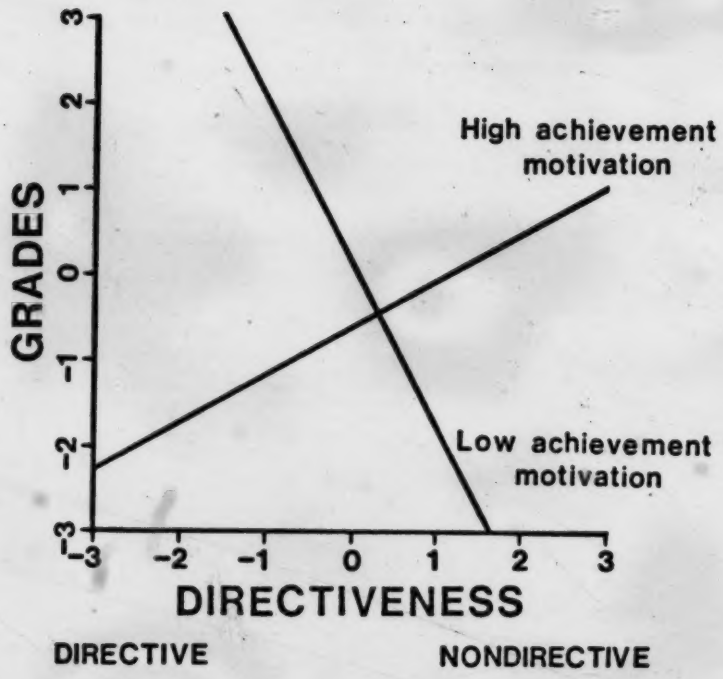

Figure 1. The interactive relationship of student achievement motivation and perceived teacher directiveness to grades (N = 214)[1].

[1]The standardized form of the regression equation is z = -.62x -.45y +.98xy where z = grades, x = student achievement motivation, and y = perceived teacher directiveness. "High achievement motivation" is 1 SD above the M and "low achievement motivation" is 1 SD below the M. The M of 0 was substituted for each of the variables in the original regression equation which are not present in the figure.

accounted for an additional 2.54% of the variance, F (1, 207) = 5.80, $p < .05$. Students were somewhat more satisfied with female teachers. Sex of the student accounted for an additional 1.72% of the variance in satisfaction, F (1, 206) = 3.99, $p < .05$, with females being somewhat more satisfied

than males. Only the addition of compulsivity or locus of control made a significant additional contribution to the variance accounted for in satisfaction. For compulsivity, the magnitude of the additional variance accounted for was 1.7%, F (1, 205) = 3.94, $p < .05$. For locus of control, the magnitude was 3.6%, F (1, 205) = 8.75, $p < .001$. The addition of perceived teacher directiveness significantly improved each of the 12 regression equations. The magnitude of the additional variance accounted for in satisfaction ranged from 30.1%, F (1, 204) = 111.46, $p < .001$, for the locus of control equation to 32.3%, F (1, 204) = 116.68, $p < .001$, for the convergent-divergent ability equation.

With regard to interaction effects, as with grades, only achievement motivation interacted with perceived teacher directiveness to make a significant increment in the variance accounted for in satisfaction. The interaction effect accounted for an additional 2.2% of the variance in satisfaction, F (1, 203) = 7.89, $p < .01$, and is graphically shown in Figure 2.

Since only one significant interaction effect was found for each of the criteria in the present study, the regression models planned to contain only nonredundant interactive predictors could not be constructed.

The general lack of expected interactive relationships prompted *post hoc* searches for any evidence of such relationships or for explanations as to why they may not have occurred.

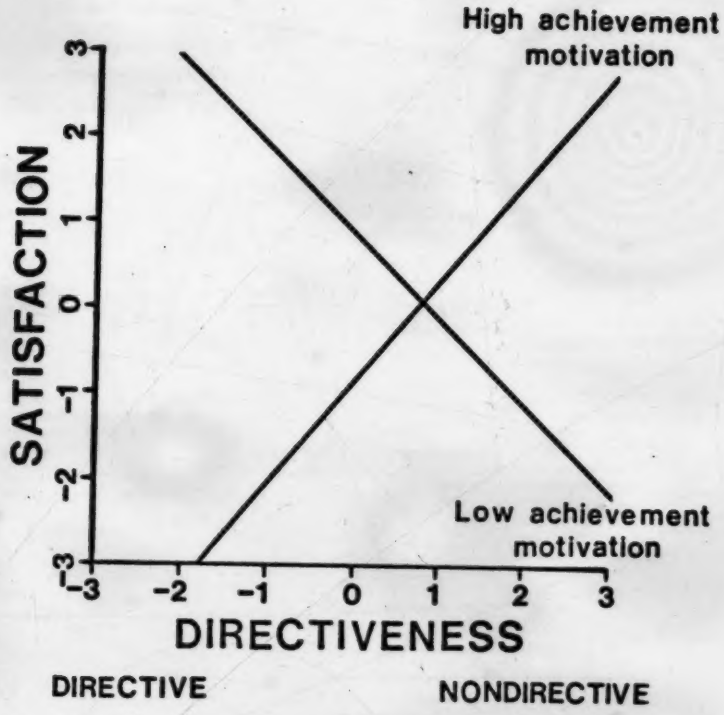

Figure 2. The interactive relationship of student achievement motivation and perceived teacher directiveness to satisfaction (N = 214)[1].

[1]The standardized form of the regression equation is z = -.85x +.08y +1.10xy where z = satisfaction, x = student achievement motivation, and y = perceived teacher directiveness. "High achievement motivation" is 1 SD above the M and "low achievement motivation" is 1 SD below the M. The M of 0 was substituted for each of the variables in the original regression equation which are not present in the figure.

To make use of a greater proportion of the available data, and hence to maximize the power of the analyses, separate regression equations were computed for each personological variable with grades and satisfaction as the

criteria on the maximum number of cases for which no relevant data were missing. For each regression, all cases were included for which values were available for the dependent variable, the covariates, the student personological variable in question, and perceived teacher directiveness. The N on which each analysis was based and the increments in the amount of variance accounted for in grades and satisfaction by the covariates as a group, the student personological variable in question, perceived teacher directiveness, and the interaction of the particular student variable and perceived teacher directiveness appear in Table 9.

For each regression equation with grades as the criterion, the covariates as a group accounted for a significant portion of the variance. The magnitude of the variance accounted for ranged from 9.5%, F (7, 304) = 4.57, $p < .001$, for the compulsivity equation to 12.4%, F (7, 258) = 5.21, $p < .001$, for the relative convergent-divergent ability equation. The entering of dogmatism, intelligence, conceptual level, anxiety, achievement motivation, and extraversion-introversion into their respective equations accounted for significant proportions of additional variance in grades. The magnitude of the additional variance accounted for ranged from 1.8%, F (1, 304) = 6.26, $p < .05$, for anxiety to 25.1%, F (1, 259) = 102.31, $p < .001$, for intelligence. Perceived teacher directiveness significantly improved the equations for authoritarianism, relative

Table 9
Results of Individual Regressions to Test for the Contributions of the Covariates, the Student Variable, Perceived Teacher Directiveness, and the Interaction (Maximum N)

Student Variable	Criterion	N	R^2 after Covariates	R^2 after Student Variable	R^2 after Perceived Directiveness	R^2 after Interaction
Authoritarianism	Grades	315	.099***	.107	.118*	.118
	Satisfaction	306	.081***	.093*	.450***	.450
Dogmatism	Grades	315	.099***	.135***	.145	.145
	Satisfaction	306	.081***	.086	.451***	.451
Intelligence	Grades	267	.114***	.365***	.366	.367
	Satisfaction	233	.112***	.118	.438***	.438
Relative convergent-divergent ability	Grades	266	.124***	.127	.142*	.142
	Satisfaction	301	.078***	.079	.453***	.454
Conceptual level	Grades	269	.114***	.156***	.176*	.176
	Satisfaction	302	.078***	.082	.456***	.457
Anxiety	Grades	313	.097***	.115*	.127*	.132
	Satisfaction	304	.082***	.100*	.453***	.455
Compulsivity	Grades	312	.095***	.100	.115*	.124
	Satisfaction	305	.082***	.084	.453***	.453
Achievement motivation	Grades	316	.097***	.146***	.155	.156
	Satisfaction	307	.081***	.097*	.458***	.465*
Relative achievement-via-independence	Grades	315	.097***	.097	.114*	.114
	Satisfaction	306	.082***	.085	.451***	.451
Locus of control	Grades	311	.098***	.100	.113*	.118
	Satisfaction	302	.083***	.106**	.460***	.460
Relative independence-dependence	Grades	315	.097***	.102	.119*	.123
	Satisfaction	306	.082***	.083	.452***	.459
Extraversion-introversion	Grades	315	.096***	.130***	.149**	.149
	Satisfaction	306	.082***	.082	.458***	.458

* $p < .05$ ** $p < .01$ *** $p < .001$

convergent-divergent ability, conceptual level, anxiety, compulsivity, relative achievement-via-independence, locus of control, relative independence-dependence, and extraversion-introversion. The magnitudes of the increments ranged from 1.1%, F (1, 306) = 3.91, $p < .05$, for the authoritarianism equation to 2.0%, F (1, 259) = 6.04, $p < .05$, for the conceptual level equation. The interaction of the student personological variable and perceived teacher directiveness did not contribute significantly to any of the equations.

For each equation with satisfaction as the criterion, the covariates as a group accounted for a significant proportion of the variance, the magnitudes ranging from 7.8%, F (7, 294) = 3.55, $p < .001$, for the conceptual level equation to 11.2%, F (7, 225) = 4.06, $p < .001$, for the intelligence equation. The introduction of authoritarianism, anxiety, achievement motivation, and locus of control to their respective equations produced significant increments in the variance accounted for in satisfaction. The increments ranged from 1.2%, F (1, 297) = 3.86, $p < .001$, for authoritarianism to 2.3%, F (1, 293) = 7.52, $p < .001$, for locus of control. The entrance of perceived teacher directiveness significantly increased the predictive capacity of each equation. The magnitudes of the additional variance accounted for in satisfaction ranged from 32.0%, F (1, 223) = 127.01, $p < .001$, for intelligence to 37.5%, F (1, 296) = 204.77, $p < .001$, for extraversion-introversion.

Only in the case of achievement motivation did the interaction of perceived teacher directiveness and the student variable make a significant contribution. The interaction accounted for an additional .7%, F (1, 296) = 4.12, $p < .05$. The nature of the interaction is shown in Figure 3.

The possibility was considered that student sex and/or teacher sex might moderate the interactive relationships which were being sought. Differences in interactive patterns have been reported for student sex (e.g., Arlin, 1975) and for teacher sex (e.g., House & McKeachie in McKeachie, Milholland, Mann, & Isaacson, 1968). Consequently, two new product terms were created for each of the student personological variables by multiplying the 2-way interaction term by student sex and by teacher sex.

When the student sex x student personological variable x perceived teacher directiveness term was entered into each of the equations with grades and satisfaction as the criteria on the common data base (N = 214) shown in Table 7, only one significant 3-way interaction emerged. The 3-way interaction accounted for a significant additional increment of 1.6%, F (1, 202) = 5.87, $p < .05$, in the variance accounted for in satisfaction when locus of control was the student variable. To determine the nature of the this 3-way interaction, the common data base (N = 214) was subdivided and separate regression equations were computed for males (N = 77) and for females (N = 137) with locus of control as the

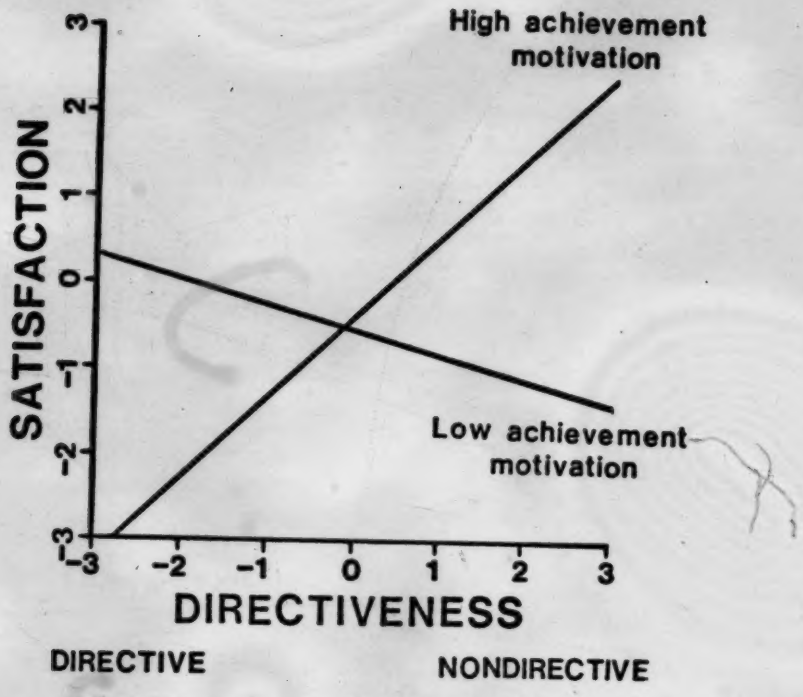

Figure 3. The interactive relationship of student achievement motivation and perceived teacher directiveness to satisfaction (N = 307)[1].

[1]The standardized form of the regression equation is z = -.39x +.32y +.60xy where z = satisfaction, x = student achievement motivation, and y = perceived teacher directiveness. "High achievement motivation" is 1 SD above the M and "low achievement motivation" is 1 SD below the M. The M of 0 was substituted for each of the variables in the original regression equation which are not present in the figure.

student variable and satisfaction as the criterion. For males, the interaction of perceived teacher directiveness and locus of control made a nonsignificant increase of .5%, F (1, 67) = .73, in the variance accounted for in

satisfaction. Similarly, for females, the interaction made only a marginal increase of .02%, F (1, 127) = .05, ns.

When the teacher sex x student personological variable x perceived teacher directiveness term was entered into each of the equations with grades and satisfaction as the criteria on the common data base (N = 214) shown in Table 7, two significant 3-way interactions emerged. The 3-way interaction accounted for a significant increment in the variance accounted for in satisfaction of 1.1%, F (1, 202) = 4.01, $p < .05$, with intelligence as the student variable and 1.6%, F (1, 202) = 5.73, $p < .05$, with relative achievement-via-independence as the student variable. However, when separate regression equations were computed for males and for females, no significant 2-way interactions surfaced. For males, the interaction of perceived teacher directiveness and intelligence accounted for less than .001% of additional variance in satisfaction, F (1, 67) = .06, ns, and the interaction of perceived teacher directiveness and relative achievement-via-independence accounted for approximately .001% of additional variance in satisfaction, F (1, 67) = .16, ns. For females, the interaction of perceived teacher directiveness and intelligence accounted for an additional 1.2% of the variance in satisfaction, F (1, 127) = 2.54, ns, while the interaction of perceived teacher directiveness and relative achievement-via-independence made an additional contribution of only .5%, F (1, 127) = .71, ns, to the variance accounted

for in satisfaction.

IV. Discussion

Although the results of past research suggested that the 12 student variables (authoritarianism, dogmatism, intelligence, convergent-divergent ability, conceptual level, anxiety, compulsivity, achievement motivation, achievement orientation, locus of control, independence-dependence, and extraversion-introversion) should interact with perceived teacher directiveness in relation to grades and satisfaction, little support was found for this position in the present study. Only in regard to achievement motivation was there any statistical evidence that interactions had in fact occurred.

Regression analyses employing the common data base (N = 214) indicated that student achievement motivation interacted with perceived teacher directiveness in a similar manner with grades and with satisfaction as the criterion. Students with high achievement motivation attained higher grades and reported greater satisfaction with the teacher and the course when the teacher was perceived to be more nondirective, while students with low achievement motivation attained higher grades and reported greater satisfaction with the teacher and the course when the teacher was perceived to be more directive. The interactive relationship for each criterion was clearly disordinal and the slopes were very much alike. In both cases, students with low achievement motivation were about as sensitive to changes in perceived teacher directiveness as students with high

achievement motivation.

Taken alone and at face value, the finding of similar interactive patterns with both grades and satisfaction lends rather impressive support to Cronbach's (1967) theoretical formulations that students with high achievement motivation should prosper from more nondirective teaching strategies while students with low achievement motivation are more apt to profit from more directive approaches. Until the present research, no explicit test of the underlying hypothesis had been made, although indirect, equivocal, and qualified support was put forward by McKeachie (1961), Patton (1955), Koenig and McKeachie (1959), and Doty (1967).

In light of the failure to find interactive relationships involving the 11 other student variables, caution must be exercised, however, in accepting a general disordinal interaction for achievement motivation in the population. Simply on the grounds of statistical probability, at least one interaction among the 12 tested might be expected to surface at a significant level purely by chance. Furthermore, since the prior evidence for interactive relationships appeared stronger for at least seven of the other 11 student dimensions--authoritarianism, dogmatism, intelligence, convergent-divergent ability, anxiety, achievement orientation, and locus of control--than it was for achievement motivation, one is left on very tenuous grounds accepting the achievement motivation interaction while allowing that no other interactions

occurred.

To accept the achievement motivation interaction, one would seem destined to argue that the interaction effect must be so pronounced relative to interactions involving the other student variables that any suggested inadequacies in research design such as a flawed sample, weak assessment techniques, or lack of impact of treatments could only be overcome by the superior strength of the interactions involving achievement motivation. Given that such a direct test of the interactive hypothesis with achievement motivation as the student construct has never before been carried out, this remains a possibility, albeit an exceedingly remote one.

The results of the supplemental analyses which made use of the maximum available data for each regression test also undermine the temptation to accept the reality of the achievement motivation interaction effect in the population, at least insofar as grades is concerned. It is difficult to imagine the formulation of a supportive argument as to why the interaction effect should be significant with an N of 214 and nonsignificant, in fact almost nonexistent, when the N is enlarged to 316. With satisfaction as the criterion, the interaction effect was stable however, and, as would be expected, at a more stringent significance level with an N of 307 than with an N of 214. The interactive pattern was substantially retained except that students with low achievement motivation did not seem to be quite as sensitive

to levels of perceived teacher directiveness as students with high achievement motivation.

The lack of significant interaction effects is rather surprising given the degree of prior substantive knowledge used to select the 12 student variables which were used in the study. Since it was expected that few tests of true null hypotheses would be made, the bias appeared to be toward committing Type I errors rather than Type II errors. Yet, no methodological problems seem readily apparent to explain why Type II errors may have occurred.

Although the sample was neither entirely random nor comprised of all the students in each of the eligible classes at all of the schools, as was initially intended, the obtained subjects do seem to be fairly representative of the particular population from which they were drawn. Slightly more than half of the teachers and students were female and just less than half of the students were in Grade 12. Perhaps the students of female teachers were somewhat overrepresented with approximately 67% of the female students and 62% of the male students coming from the classes of female teachers. It appears that this overrepresentation was mostly due to the fact that the two teachers at School E, where student participation was high, were female. This resulted in the students of female teachers being even more overrepresented in the subsample of 214 used for the common regression analyses, where about 78% of the female students and 71% of the male students were

enrolled in the classes of female teachers. Why Grade 12 students and male students were also substantially underrepresented in this subsample is not clear. Thirty-seven percent of the students were in Grade 12 and only 36% of the students were male.

Even though these unexpected imbalances in the distributions of sex and grade level occurred, it is unlikely that they could be responsible for the attenuation of the interactive relationships. Three-way interaction analyses using teacher sex and student sex yielded a few small but significant 3-way interaction effects but when the subsample was subdivided into male and female teachers and male and female students, the interaction of perceived teacher directiveness and each of the student variables never attained significance. Furthermore, sex of the teacher and sex of the student only accounted for less than 6% of the variance in grades and satisfaction and subsequent exploratory analyses not reported here showed that none of the interaction effects was significant even when the covariates were not entered into the regression equations. A similar argument can be made for grade level, which only accounted for trivial amounts of variance in grades and satisfaction.

Although participation rates were lower in many classes than would have been desired, the overall effective Ns on which the tests for interactions were carried out seem adequate. The minimum N of 214 exceeds the general rule of

thumb of 100, and preferably 200 or more, for a regression analysis suggested by Kerlinger and Pedhazur (1973, pp. 446-447) and Cronbach and Snow (1977, p. 45). The Ns also yield sufficient power to reject the null hypotheses if the hypotheses were indeed false. For example, on the basis of the power formulas of Cohen and Cohen (1975, pp. 117-119), an N of 214 yields a power coefficient between .50 and .60 for testing the interaction effect, assuming that all the variables in the equation account for 15% of the variance in the criterion and that 2% is uniquely determined by the interaction. On the other hand, assuming that 45% of the variance in the criterion is accounted for by all the variables in the equation and that 2% is uniquely determined by the interaction effect, the power coefficient rises to between .75 and .80. Increasing the N to 300 gives power coefficients between .70 and .75, and, .90 and .95, respectively.

It would have been more desirable to have approximately equal numbers of students for each teacher in the analyses. Only 20.6% of the students were in the classes of the 32% of the teachers in the workable subsample (N = 359) who had mean perceived teacher directiveness scores falling outside plus or minus one standard deviation from the grand mean of the perceived teacher directiveness scores. In contrast, 53.5% of the students were in the classes of the 28% of the teachers who had mean perceived teacher directiveness scores falling plus or minus half of one standard deviation from

the grand mean. The lack of a flatter distribution curve does not undermine the appropriateness of the analytical techniques but it may have somewhat attenuated the interactive relationships. The variance of perceived teacher directiveness scores might have been less restricted for a more balanced sample. Nevertheless, mean perceived teacher directiveness scores were significantly different across teachers, with about 34% of the variance in perceived teacher directiveness scores being attributable to differences between teachers.

It also does not appear that weak assessment techniques can be blamed for the lack of interaction effects in the present research. Personological measures were selected on the basis of their desirable psychometric properties and in most instances were the same instruments employed by other researchers who did find evidence of interactions. The perceived teacher directiveness measure too has been used successfully in this context in the past (e.g., McCann & Fisher, 1977) and seems most appropriate for the present research. The measurement of satisfaction with the Student Satisfaction Scale was direct and overt and the scale did show evidence of sound psychometric characteristics in an earlier administration by the author. The merits and liabilities of the perennial favorite among educational outcome variables--teacher assigned grades--were not under the control of the researcher but surely on the pervasiveness of its use, grades must be deemed at least

"suitable" and of course numerous studies have used grades successfully as a criterion.

This entire study rests on the assumption that the interactive relationships involving each of the 12 student variables and teacher directiveness can be substantially replicated. Given the apparent failure to find any evidence that 11 of the 12 expected interaction effects materialized, it seems worthwhile and timely to discuss the whole question of replication, not only in the present context but in ATI research in general.

If research findings are to be accepted as true phenomena they should be consistent in each repetition of the research (Borg & Gall, 1971). Although replicability is usually considered the most fundamental criterion put forth by the scientific method for judging the validity of research findings (Bauernfiend, 1968; Raney, 1970) and is ultimately necessary for the development of confidence in research results (Selltiz, Jahoda, Deutsch, & Cook, 1959), it has not been widely discussed in either educational research (Shaver, 1979) or psychological research (Raney, 1970; Smith, 1970).

Lykken (1968) defines three types of replication: literal replication, operational replication, and constructive replication. Literal replication refers to replication which is exact in every respect to the original investigation. For example, the original researcher might use twice as many subjects as are necessary, randomly

earmark the subjects for the purposes of two parallel analyses, and observe whether or not the statistical results are similar. Finding significant relationships for one half and nonsignificant relationships for the other half would be evidence for the presence of a Type I error. Unfortunately, this is almost never done.

Operational replication occurs when a second researcher attempts to do the same study as the initial researcher by following the reported method of the first piece of research. There is a general lack of this kind of replication, particularly in the present ATI context. One notable, and successful, operational replication took place when Domino (1975) replicated the Dowaliby and Schumer (1973) study to show that high anxiety students achieved to a higher degree in a teacher-centered class than in a student-centered class while the converse occurred for low anxiety students.

In carrying out a constructive replication, imitation of the method of the initial study is deliberately avoided. Only the relationship which the first researcher claims to have established is of importance. The second researcher is free to formulate the particulars of his own study. In fact, the hypothesized relationship becomes even more credible when it is maintained over several constructive replications in which the measures and procedures differ (Borg & Gall, 1971). Perhaps the best example of constructive replication in the present ATI context occurred when Domino (1971),

using an experimental approach, replicated the findings of Domino (1968), in which a naturalistic approach was employed. In each study, students more oriented to achievement-via-independence did better with a nondirective teaching strategy while students more oriented to achievement-via-conformance did better with a directive teaching strategy. "Domino's report gains solidity from the fact that much the same result was found by his two investigations with different techniques" (Cronbach & Snow, 1977, p. 493).

The notion that ATIs simply do not exist in the population seems too harsh, although some workers in the field are of this opinion. For example, Glass (1970) states firmly:

> "There is no evidence for an interaction of curriculum treatments and personological variables." I don't know of another statement that has been confirmed so many times by so many people.
> (pp. 210-211)

Bracht (1970), a pupil of Glass, also thought the effort to find disordinal interactions futile. In his review of 90 studies, only 5 of 108 possible interactions were significantly disordinal. But Bracht relied on a definition of disordinality put forth earlier by Bracht and Glass (1968) wherein an interaction was considered to be disordinal only if the difference between the two treatments at two levels of a personological variable were both significantly greater than zero and opposite in algebraic sign. This definition may be unduly severe and Bracht and

Glass apparently are now ready to discard it (Cronbach & Snow, 1977, p. 93). In any case, both disordinal and ordinal interactions should be accepted; both kinds of interaction information are useful (McCann & Short, 1982). Cronbach and Snow (1977, pp. 494-496) also have several other reservations about Bracht's analytical review but they do generally agree with his conclusion that demonstrated ATIs in the literature are rather rare (Ragsdale, 1980).

Even if reported significant ATIs are not abundant, Cronbach and Snow (1977) have argued strongly that this does not mean that they do not exist:

> While results in ATI studies have often been negative, this does not deny the hypothesis. Most studies used samples so small that a predominance of 'chance results' was rendered inevitable. (p. 493)

"Chance results" here refers to nonsignificant ATIs which suggest that Type II errors may have occurred.

But what about Type I errors? Cohen and Hyman (1980) have pointed out that while "over 70 percent of published studies in American Psychological Association, AERA, and Council for Exceptional Children journals lack statistical power,...many hypotheses in educational research are supported" (p. 12). Cohen and Hyman therefore view the large number of statistically significant findings with suspicion.

Cohen and Hyman concluded that "experimenter bias may have been so powerful that, regardless of the realities of probability statistics, the experimental results were foreordained" (p. 13). Hsu (1980) suggested other reasons

why low power studies may have yielded a high proportion of statistically significant results: the magnitudes of the effects may have been large in the population; journal policies may have led to the selection of manuscripts on the basis of significant results; journal policies may have led to the selection of studies for which the magnitudes of the effects were relatively large and the power was consequently underestimated.

In the ATI literature reviewed for the current project, a rather large number of studies appeared to have lacked adequate power but the majority turned up significant results which could be construed as support for the interactional hypotheses in question. Yet the findings did not replicate in the present study and there were failures to replicate in some earlier studies. If the interactional effects in the population are actually quite large then the chances of interactional effects failing to replicate should be low. Therefore, it does not seem likely that either of Hsu's (1980) reasons for the preponderance of significant results which assume that the population effects are large can be instituted as a solid explanation for the imbalance of significant results reported in the earlier studies. So the possibility remains that many significant interactional results materialized in earlier research because of experimenter bias effects or because journal policies favour studies with significant results, or both. In either case, such arguments suggest that many of the ATI effects found

may not actually exist in the population and this is the view that is fostered by the results of the present research.

Although the failures to replicate in the present study were overwhelming and pervasive, some were even more alarming than others. For example, McCann and Fisher (1977) used a similar population of secondary school students, the SPOTS scale, the same authoritarianism and dogmatism measures, the same English grades as one criterion, a similar satisfaction scale as another criterion, and the same analytical procedure, but uncovered significant interactive relationships in the expected directions even though the sample size was somewhat smaller than in the present study. Elements of the current investigation are also similar to the Dowaliby and Schumer (1973) research; the results are not. Dowaliby and Schumer found that high anxiety students received higher grades when they perceived the course to be structured while low anxiety students did better when they perceived the course to be unstructured. Another disturbing example was pointed out earlier: the interaction of achievement motivation and perceived teacher directiveness in relation to grades in the present study was significant for an N of 214 but nonsignificant for an N of 316. This is particularly distressing since it is a failure of a literal type of replication. Even several simple correlations between personological dimensions failed to replicate earlier findings. For example, the present

research did not replicate the relationship between authoritarianism and anxiety (Fehr & Heintzelman, 1977), authoritarianism and locus of control (Zuckerman & Gerbasi, 1975), authoritarianism and independence-dependence (Gordon, 1971), dogmatism and anxiety (Vacchiano, Straus, & Schiffman, 1968), dogmatism and locus of control (Everly, 1975), dogmatism and independence-dependence (Gordon, 1971), intelligence and independence-dependence (Flanders, Anderson, & Amidon, 1960), intelligence and extraversion-introversion (Lynn & Gordon, 1961), conceptual level and locus of control (Hunt & Hardt, 1967), anxiety and compulsivity (Brackbill & Little, 1954), anxiety and achievement motivation (Peterson, 1976), anxiety and extraversion-introversion (Eysenck, 1970), achievement motivation and extraversion-introversion (Doty, 1967), locus of control and achievement motivation (Gough, 1974), and achievement orientation and intelligence (Gough, 1975).

In the literature reviewed for the present project, the number of significant results pointing to interactive patterns and the consistency of the composite profiles of students who should benefit from directive and nondirective teaching seemed rather convincing. However, few studies were actually close replications of earlier studies. In regard to psychological research in general, Smith (1970) has said:

> One cannot help wonder what the impact might be if every investigator repeated the study he believed to be his most significant contribution to the field. (p. 974)

One surely cannot help but wonder what the impact would be if Smith's suggestion was applied to the ATI research in the present context.

Replication can be looked upon as an alternative to inferential statistics (Shaver, 1979). What is of ultimate importance in the determination of scientific or educational "significance" is the magnitude of the effect (Cohen & Hyman, 1979) and its consistency from study to study. As Borg and Gall (1971) put it:

> If the researcher is able to replicate his findings, they are of much more 'significance' to other educational researchers than a statistically significant but weak finding...obtained in the original study. A replicated study is strong evidence against the probability that a Type I error occurred in the original study. (p. 290)

But clearly when a study has the power and there is no significance and no sizeable effect one must seriously consider whether previously reported results are suggestive or illusory.

It was anticipated that the planned regression models constructed from a modified free stepwise analysis of the 12 interactive relationships of student personological variables and perceived teacher directiveness for each of the dependent variables would give some idea of the combined magnitude of the interaction effects, would pinpoint a suitable set of important personological variables, would provide guidelines for further research, would be useful for predictive purposes in future work, would eventually lead to insight into the processes involved, would serve as bases on

which to evaluate the variance accounting capacities of any new personological variables which might be suggested to be important in the future in this interactive framework, would facilitate theory building, and would simplify thoughts about applications in the present context. Because of gross failures to replicate previous findings, the regression models could not be constructed and consequently none of these higher goals could be met or even addressed. It is exceedingly difficult, if not impossible, to confidently and fruitfully extend theory and research sophistication when the foundation seems so soft and fragile.

The overriding implication of the results of the present study is clear. There is an absolute and immediate need for literal replication, operational replication, and constructive replication in ATI research. The whole ATI endeavour is in grave danger of losing its most avid and active supporters, who have so enthusiastically accepted its interactional tenets, if increasing confidence cannot be placed in the establishment of some consistent, even if somewhat qualified, generalizations. If interactional psychology cannot combat and withstand the common "crisis in research associated with extremely inefficient procedures for establishing generalizations (Epstein, 1980, p. 791) which has plagued its ancestral alternatives, in the future the movement is in danger of becoming a catalyst toward the ever increasing disillusionment with psychological research to which Adair (1980) refers:

> We are trained from undergraduate classes through graduate school with examples of psychology's seemingly facile accomplishments. After a decade of research most of us awaken to the realization that the scientific study of human behaviour is not easy; that progress will be slow. But we lack a yardstick against which to measure our successes and failures, our rate of progress. As we encounter difficulties with our methods the lack of accomplishments rather than the challenge of the discipline becomes salient. This is the source of the contemporary disillusionment of the academician-researcher. (p. 169)

The ATI literature is vast and expanding rapidly but still relatively manageable within its boundaries. It is time now to reconsider what has been done thus far, to attempt to discern what is "known" and what is not. "It's not what we don't know that hurts; it's what we know that ain't so that hurts" (Bauernfeind, 1968, p. 126). Now, before further elaborations and their consequent inconsistencies are propogated within the ATI orientation, Shaver's (1979) suggestion in regard to replication should be adhered to, not only by graduate students but by other researchers in the field:

> Acceptance of the self-testing, self-correcting mode of science as a guide for structuring educational research would likely lead to the debunking of the myth that graduate students' research must be 'original' to be worthwhile and to giving serious attention to proposals that replication research be accorded greater respectability....Replication as a research strategy not only has high potential for theory-building, but replication studies can be sufficiently challenging....A major challenge will be to avoid trivial replications. Involvement in decisions about which studies have sufficient theoretical promise to warrant direct replications would make important contributions to knowledge...might lead to greater engagement of graduate students in science as an ongoing intellectual process. Out of this involvement, more graduate students may come to see the potential of their own research as a contribution to scientific knowledge, rather than as only an obstacle to be

overcome in order to obtain a degree. (pp. 6-7)

Replication may restore vitality, even sustain life, in ATI research and interactional strategies in psychology in general. On the other hand, failures to replicate may diminish interest in the paradigm. For either return, the chance must be taken. That theoretical speculations must eventually be grounded dependably in the interrelationships of empirical referents is axiomatic in the scientific approach to the study of behavior.

V. Summary and Conclusions

Past research had suggested that 12 student personological variables--authoritariansim, dogmatism, intelligence, convergent-divergent abilities, conceptual level, anxiety, compulsivity, achievement motivation, achievement orientation, locus of control, independence-dependence, and extraversion-introversion--interact with perceived teacher directiveness in relation to grades and satisfaction. There was also evidence of moderate intercorrelation among most of the student variables. This correlativity directly suggested that some of the interactive relationships which had surfaced may not have been independent. Consequently, the present project was undertaken to simplify the multivariate nature of the interactive relationships which were necessarily viewed as operative by carrying out a modified free stepwise regression analysis of the 12 interactive relationships which it was hoped would yield a lesser number of nonredundant interactions, weighted according to how much unique variance they could account for in grades and satisfaction. It was anticipated that the resultant regression models would facilitate theory building, would simplify ATI applications, and would serve as bases on which to evaluate the variance accounting capacities of any new variables which might be suggested to be important within this interactive context.

Data were collected from 445 students in the classes of 26 Grade 11 and 12 English teachers at five high schools in

regard to English grades and satisfaction with the teacher and the course, the 12 personological dimensions, and the perceived level of teacher directiveness. Individual regression analyses revealed that only student achievement motivation showed any signs of interacting with perceived teacher directiveness in relation to grades and satisfaction in the present study. From the current data, it appeared that students with high achievement motivation attained higher grades and reported greater satisfaction with the teacher and the course when the teacher was perceived to be more nondirective, while students with low achievement motivation attained higher grades and reported greater satisfaction with the teacher and the course when the teacher was perceived to be more directive. Since no other interactive relationships materialized, the nonredundant regression models could not be produced.

The failure to replicate any of the other 11 previously reported interactive relationships calls into question not only the generalizability of the achievement motivation interaction which did attain a suitable level of statistical significance in the present study but also the dependability of previous research results within this ATI context.

It is concluded that ATI research within the present context and in general must come to depend more upon literal, operational, and constructive replication if confidence in findings is to be fostered. The foundation must be stronger or the ATI endeavour seems disposed to

collapse. At the metaphysical level it may maintain its theoretical appeal but if it ever hopes to offer anything of substance to the establishment of an instructional theory which profits from knowledge of the interactive relationships of pupil characteristics and instructional strategies to educational outcomes it must become more soundly grounded in reliable observations.

References

Abraham, C. The relationship of authoritarianism to independence and creativity among college students. Dissertation Abstracts International, 1972, 32, 6023B.

Adair, J.G. Psychology at the turn of a century: Crises, challenges, promises. Canadian Psychology, 1980, 21, 165-178.

Adorno, T., Frenkel-Brunswik, E., Levinson, D., & Sanford, N. The authoritarian personality. New York: Harper, 1950.

Amidon, E., & Flanders, N.A. The effects of direct and indirect teacher influence on dependent-prone students learning geometry. Journal of Educational Psychology, 1961, 52, 286-291.

Amidon, E.J., & Flanders, N.A. The role of the teacher in the classroom. Minneapolis: Amidon and Associates, 1963.

Amidon, E.J., & Simon, A. Teacher-pupil interaction. Review of Educational Research, 1965, 35, 130-139.

Anderson, J.P. Student perceptions of teacher influence. Unpublished doctoral dissertation, University of Minnesota, 1960. Cited in N.A. Flanders, J.P. Anderson, & E.J. Amidon, Measuring dependence proneness in the classroom. University of Minnesota Bureau of Educational Research Memo, 1960, No. Ber 60-6.

Anderson, R.C. Learning in discussions: A resume of the authoritarian-democratic studies. Harvard Educational Review, 1959, 29, 201-215.

Arlin, M. The interaction of locus of control, classroom structure, and pupil satisfaction. Psychology in the Schools, 1975, 12, 279-286.

Athanasiou, P. Techniques without mystique: A study of authoritarianism in engineering students. Educational and

Psychological Measurement, 1968, 28, 1181-1188.

Atkinson, J.W. An introduction to motivation. Princeton: Van Nostrand, 1964.

Atkinson, J.W., & Feather, N.T. A theory of achievement motivation. New York: John Wiley & Sons, 1966.

Babikian, Y. An empirical exposition to determine the relative effectiveness of discovery, laboratory, and expository methods of teaching science concepts. Journal of Research in Science Teaching, 1971, 8, 201-210.

Bannister, R.L. A comparative study of extraversion-introversion traits to two instructional methods. Dissertation Abstracts International, 1974, 34, 4853A.

Barker, E.N. Authoritarianism of the political right, center, and left. Journal of Social Issues, 1963, 19, 63-74.

Bar-Yam, M. The interaction of student characteristics with instructional strategies: A study of students' performance and attitude in a high school innovative course. Unpublished doctoral dissertation, Harvard University, 1969. Cited in L.J. Cronbach and R.E. Snow, Aptitudes and instructional methods. New York: Irvington, 1977.

Bauernfeind, R.H. The need for replication in educational research. Phi Delta Kappan, 1968, 50, 126-128.

Beach, L.R. Sociability and academic achievement in various types of learning situations. Journal of Educational Psychology , 1960, 51, 208-212.

Bennett, N. Teaching styles and pupil progress. London: Open Books, 1976.

Berliner, D.C., & Cahen, L.S. Trait-treatment interaction and learning. In F.N. Kerlinger (Ed.), Review of research in education I. Itasca, Illinois: F.E. Peacock, 1973.

Borg, W.R., & Gall, M.D. Educational research: An introduction (2nd ed.). New York: David McKay, 1971.

Brackbill, G., & Little, K.B. MMPI correlates of the Taylor Scale of Manifest Anxiety. Journal of Consulting Psychology, 1954, 18, 433-436.

Bracht, G.H. Experimental factors related to aptitude-treatment interactions. Review of Educational Research, 1970, 40, 627-645.

Bracht, G.H., & Glass, G.V. The external validity of experiments. American Educational Research Journal, 1968, 5, 437-474.

Brophy, J.E., & Good, T.L. Teacher-student relationships: Courses and consequences. New York: Holt, Rinehart and Winston, 1974.

Brown, R. The effects of congruency between learning style and teaching style on college student achievement. College Student Journal, 1978, 12, 307-309.

Bruner, J.S. Social psychology and perception. In E.F. Maccoby, T.M. Newcomb, & E.L. Hartley (Eds.), Readings in social psychology. New York: Holt, Rinehart and Winston, 1958.

Bundy, R.F. An investigation into the use of a programmed guide on the effectiveness of problem analysis behavior in public school administrators. Unpublished doctoral dissertation, Syracuse University, 1968. Cited in D.E. Hunt, Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Burke, H.R. Raven's Progressive Matrices: A review and critical evaluation. Journal of Genetic Psychology, 1958, 93, 199-228.

Buss, A.R. The trait-situation controversy and the concept of interaction. Personality and Social Psychology Bulletin, 1977, 3, 196-201.

Butterfield, E. Locus of control, test anxiety, reactions to

frustration and achievement attitudes. Journal of Personality, 1964, 32, 355-370.

Calvin, A.D., Hoffman, F.K., & Harden, E.L. The effect of intelligence and social atmosphere on group problem solving behavior. Journal of Social Psychology, 1957, 45, 61-74.

Carroll, J.B. Instructional methods and individual differences. In R.M. Gagne (Ed.), Learning and individual differences., New York: MacMillan, 1967.

Chan, R. The effect of group learning on performance and satisfaction change as a function of need for affiliation. Unpublished doctoral dissertation, University of Toronto, 1975. Cited in D.E. Hunt, L.F. Butler, J.E. Noy, and M.E. Rosser, Assessing conceptual level by the paragraph completion method. Toronto: Ontario Institute for Studies in Education, 1978.

Clarke, D.E. Measures of achievement and affiliation motivation. Review of Educational Research, 1973, 43, 41-51.

Cline, V.B., Richards, J.M., & Needham, W.E. Creativity tests and achievement in high school science. Journal of Applied Psychology, 1963, 47, 184-189. Cited in M.A. Wallach and N. Kogan, Modes of thinking in young children. New York: Holt, Rinehart and Winston, 1965.

Cohen, J. Multiple regression as a general data-analytic system. Psychological Bulletin, 1968, 70, 426-443.

Cohen, J. Partialed products are interactions; partialed powers are curve components. Psychological Bulletin, 1978, 85, 858-866.

Cohen, J., & Cohen, P. Applied multiple regression/correlation analysis for the behavioral sciences. Hillsdale, New Jersey: Lawrence Erlbaum, 1975.

Cohen, S.A., & Hyman, J.S. How come so many hypotheses in educational research are supported? Educational Researcher, 1979, 8, 12-16.

Comrey, A.L. Scales for measuring compulsion, hostility, neuroticism, and shyness. Psychological Reports, 1965, 16, 697-700.

Comrey, A.L. The Comrey Personality Scales. San Diego: Educational and Industrial Testing Service, 1970.

Comrey, A.L., & Backer, T.E. Construct validation of the Comrey Personality Scales. Multivariate Behavioral Research, 1970, 5, 469-477.

Crandall, V.C., Katkovsky, W., & Crandall, V.J. Children's beliefs in their control of reinforcements in intellectual academic achievement behaviors. Child Development, 1965, 36, 91-109.

Cronbach, L.J. The two disciplines of scientific psychology. American Psychologist, 1957, 12, 671-684.

Cronbach, L.J. How can instruction be adapted to individual differences? In R.M. Gagne (Ed.), Learning and individual differences. New York: MacMillan, 1967.

Cronbach, L.J., & Snow, R.E. Aptitudes and instructional methods. New York: Irvington, 1977.

Cross, H.J, The relation of parental training conditions to conceptual level in adolescent boys. Journal of Personality, 1966, 34, 348-365. Cited in D.E. Hunt, Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Cunningham, W.G. The impact of student-teacher pairings on student orientation toward school related tasks. Journal of Educational Research, 1975, 68, 378-381.

Daniels, R.L., & Stevens, J.P. The interaction between the internal-external locus of control and two methods of college instruction. American Educational Research Journal, 1976, 13, 103-113.

Darlington, R.B. Multiple regression in psychological research and practice. Psychological Bulletin, 1972, 77, 446-452.

Davis, R.H., Marzocco, F.N., & Denny, M.R. Interaction of individual differences with modes of presenting programmed instruction. Journal of Educational Psychology, 1970, 61, 198-204.

DeMartino, A.J. The relations among adaptive regression, independence, and creativity in adolescents. Dissertation Abstracts International, 1971, 32, 539B-540B.

Dickinson, M.L. Locus of control, self-reinforcement and modeling of self-reinforcement as related to creativity. Dissertation Abstracts International, 1975, 35, 4166B.

Domino, G. Differential prediction of academic achievement in conforming and independent settings. Journal of Educational Psychology, 1968, 59, 256-260.

Domino, G. Interactive effects of achievement orientation and teaching style on academic achievement. Journal of Educational Psychology, 1971, 62, 427-431.

Domino, G. Let the punishment fit the crime: Teacher-student interactions. Journal of Educational Research, 1975, 69, 8-11.

Doty, B.A. Teaching method effectiveness in relation to certain student characteristics. Journal of Educational Research, 1967, 60, 363-365.

Dowaliby, F.J., & Schumer, H. Teacher-centered versus student-centered mode of college classroom instruction as related to manifest anxiety. Journal of Educational Psychology, 1973, 64, 125-132.

Draper, N.R., & Smith, H. Applied regression analysis. New York: Wiley, 1966.

Dubin, R., & Taveggia, T.C. The teaching-learning paradox. Eugene, Oregon: University of Oregon Press, 1968. Cited in F.J. Dowaliby and H. Schumer, Teacher-centered versus student-centered mode of classroom instruction as related to manifest anxiety. Journal of Educational Psychology, 1973, 64, 125-132.

Duffey, J.B. The effects of authoritarian and democratic teaching styles and student's trait anxiety on the short term recall of academic material. Dissertation Abstracts International, 1974, 35, 3512A.

Edwards, A.L. Edwards Personal Preference Schedule, New York: Psychological Corporation, 1959.

Ehrlich, H.J., & Lee, D. Dogmatism, learning, and resistance to change: A review and a new paradigm. Psychological Bulletin, 1969, 71, 249-260.

Endler, N.S., & Magnusson, D. Interactional psychology and personality. Toronto: Halstead Press, 1976.

Epstein, S. The stability of behavior: II. Implications for psychological research. American Psychologist, 1980, 35, 790-806.

Everly, G.S. The dogmatism/externality correlation for college students. Psychological Reports, 1975, 37, 190.

Eysenck, H.J. The Maudsley Personality Inventory. San Diego, California: Educational and Industrial Testing Service, 1962.

Eysenck, H.J. The structure of human personality (3rd ed.). London: Methuen, 1970.

Eysenck, H.J., & Eysenck, S.B.G. Manual for the Eysenck Personality Inventory. San Diego: Educational and Industrial Testing Service, 1968.

Ezekiel, R.S. Authoritarianism, acquiescence and field behavior. Journal of Personality, 1970, 38, 31-42.

Faytinger, S. Internal-external control as a moderator of teaching style and students' satisfaction. Psychological Reports, 1978, 43, 1070.

Fehr, L.A., & Heintzelman, M.E. Personality and attitude correlates of religiosity: A source of controversy. Journal of Psychology, 1977, 95, 63-66.

Flanders, N.A. Teacher influence, pupil attitudes, and achievement. Cooperative Research Monograph No. 12, Washington, D.C.: Government Printing Office, 1965. Cited in L.J. Cronbach and R.E. Snow, Aptitudes and instructional methods. New York: Irvington, 1977.

Flanders, N.A. Interaction analysis in the classroom. A manual for observers. Ann Arbor, Michigan: University of Michigan, 1966.

Flanders, N.A., Anderson, J.P., & Amidon, E.J. Measuring dependence proneness in the classroom. University of Minnesota Bureau of Educational Research Memo, 1960, No. Ber 60-6.

Forward, J.R., & Williams, J.R. Internal-external control and black militancy. Journal of Social Issues, 1970, 26, 75-92.

Gardiner, G.S., & Schroder, H.M. Reliability and validity of the Paragraph Completion Test: Theoretical and empirical notes. Psychological Reports, 1972, 31, 959-962.

Gardner, P.L. Research on teacher effects: Critique of a traditional paradigm. British Journal of Educational Psychology, 1974, 44, 123-130.

Gehlbach, R.D. Individual differences: Implications for instructional theory, research, and innovation. Educational Researcher, 1979, 8, 8-14.

Glass, G. Discussion in W.C. Wittrock and D.C. Wiley (Eds.), The evaluation of instruction. New York: Holt, Rinehart and Winston, 1970. Cited in L.J. Cronbach and R.E. Snow, Aptitudes and instructional methods. New York: Irvington, 1977.

Goldberg, J.B. Influence of pupil attitudes on perception of teacher's behaviors and consequent school work. Journal of Educational Psychology, 1968, 59, 1-5.

Golden, C.J.S. Concept formation as a function of locus of control and method of presentation among some disadvantaged and advantaged fifth grade students. Dissertation Abstracts International, 1972, 32, 5068A.

Golding, S.L. The problem of construal styles in the analysis of person-situation interactions. In D. Magnusson and N.S. Endler (Eds.), Personality at the crossroads. Hillsdale, New Jersey: Lawrence Erlbaum, 1977.

Gordon, L.V. Are there two extremeness response sets? Educational and Psychological Measurement, 1971, 31, 867-873.

Gough, H.G. California Psychological Inventory Manual. Palo Alto, California: Consulting Psychologists Press, 1957.

Gough, H.G. An interpreter's syllabus for the California Psychological Inventory. Palo Alto, California: Consulting Psychologists Press, 1968.

Gough, H.G. Estimation of locus-of-control scores from the California Psychological Inventory. Psychological Reports, 1974, 35, 343-348.

Gough, H.G. Manual for the California Psychological Inventory. Palo Alto, California: Consulting Psychologists Press, 1975.

Goyal, R.P. A study of some personality traits of high creative children at schoolstage. Indian Educational Review, 1972, 7, 92-100.

Grimes, J.W. The interaction of certain pupil personality characteristics with methods of teaching reading in determining first-grade achievement. Unpublished doctoral dissertation, Harvard University, 1958. Cited in L.J. Cronbach and R.E. Snow, Aptitudes and instructional methods. New York: Irvington, 1977.

Grimes, J.W., & Allinsmith, W. Compulsivity, anxiety, and school achievement. Merrill-Palmer Quaterly, 1961, 7, 247-271.

Grippin, P.C. The influence of cognitive style on achievement and study time in two instructional formats. Journal of Instructional Psychology, 1976, 3, 19-22.

Guetzkow, H., Kelly, E.L., & McKeachie, W.J. An experimental

comparison of recitation, discussion, and tutorial methods in college teaching. Journal of Educational Psychology, 1954, 45, 193-209.

Guilford, J.P. An inventory of factors STDCR. Beverly Hills, California: Sheridan Supply Company, 1940.

Guilford, J.P., & Zimmerman, W.S. The Guilford-Zimmerman Temperament Survey. Beverly Hills, California: Sheridan Supply Company, 1949.

Gurin, P., Gurin, T.G., Lao, R., & Beattie, M. Internal-external control in the motivational dynamics of Negro youth. Journal of Social Issues, 1969, 25, 29-54.

Gutenson, J.A. Student characteristics predictive of performance in self-directed study in an introductory psychology course. Dissertation Abstracts International, 1978, 38, 5352A.

Haigh, G.V., & Schmidt, W.W. The learning of subject matter in teacher-centered and group-centered classes. Journal of Educational Psychology, 1956, 47, 295-301.

Hall, D.T. Effect of teacher-student congruence upon student learning in college classes. Journal of Educational Psychology, 1970, 61, 205-213.

Hanson, D.J. Validity test of the Dogmatism Scale. Psychological Reports, 1970, 26, 585-586.

Harmon, D.J. The relationships of student anxiety and dependency to the effects of teaching structure on the learning of science knowledge and processes within inductive/discovery learning. Dissertation Abstracts International, 1978, 38, 6635A.

Harvey, O.J. Beliefs and behavior. Some implications for education. Science Teacher, 1970, 37, 10-14.

Harvey, O.J., Hunt, D.E., & Schroder, H.M. Conceptual systems and personality organization. New York: Wiley, 1961.

Hastorf, A.H., Schneider, D.J., & Polefka, J. Person perception. Reading, Massachusetts: Addison-Wesley, 1970.

Heck, E.J. A study concerning the differential effectiveness of two approaches to human relationship training in facilitating change in interpersonal communication skill and style of interpersonal perception. Unpublished doctoral dissertation, Syracuse University, 1968. Cited in D.E. Hunt, Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Heil, L.M., Powell, M., & Feifer, I. Characteristics of teacher behavior related to the achievement of children in several elementary grades. Unpublished report, Brooklyn College, 1960. Cited in L.J. Cronbach and R.E. Snow, Aptitudes and instructional methods. New York: Irvington, 1977.

Heist, P., & Yonge, G. Omnibus Personality Inventory. New York: The Psychological Corporation, 1968.

Herman, W.L., Potterfield, J.E., Dayton, C,M., & Amershek, K.G. The relationship of teacher-centered activities and pupil-centered activities to pupil achievement and interest in 18 fifth-grade social studies classes. American Educational Research Journal, 1969, 6, 227-239.

Hsu, L.M. On why many hypotheses in educational research are supported and on the interpretation of sample effect sizes: A comment. Educational Researcher, 1980, 9, 6-8.

Hunt, D.E. Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Hunt, D.E., Butler, L.F., Noy, J.E., & Rosser, M.E. Assessing conceptual level by the paragraph completion method. Toronto: Ontario Institute for Studies in Education, 1978.

Hunt, D.E., & Hardt, R.H. The role of conceptual level and program structure in summer upward bound programs. Paper presented at the meeting of the Eastern Psychological Association, Boston, Massachusetts, April 1967. Cited in D.E. Hunt, Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Hunt, D.E., Lapin, S., Liberman, B., McManus, J., Post, R., Sabalis, R., Sweet, S., & Victor, J.B. Manual for coding paragraph completion responses for adolescents. Unpublished manuscript, Syracuse University Youth Development Center, 1968. Cited in D.E. Hunt, Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Hutchinson, W.L. Creative and productive thinking in the classroom. Unpublished doctoral dissertation, University of Utah, 1963. In L.J. Cronbach and R.E. Snow, Aptitudes and instructional methods. New York: Irvington, 1977.

Ittelson, W.H. Environment perception and contemporary perceptual theory. In W.H. Ittelson (Ed.), Environment and cognition. New York: Seminar Press, 1973.

Ittelson, W.H., Proshansky, H.M., Rivlin, L.G., & Winkel, G.H. An introduction to environmental psychology. New York: Holt, Rinehart and Winston, 1974.

Jackson, D.N. Personality Research Form manual. Goshen, New York: Research Psychologists Press, 1967.

Jacobson, F.N., & Rettig, S. Authoritarianism and intelligence. Journal of Social Psychology, 1959, 50, 213-219.

Kerlinger, F. The influence of research on education practice. Educational Researcher, 1977, 6, 5-12. Cited in R.D. Gehlbach, Individual differences: Implications for instructional theory, research, and innovation. Educational Researcher, 1979, 8, 8-14.

Kerlinger, F.N., & Pedhazur, E.J. Multiple regression in behavioral research. New York: Holt, Rinehart and Winston, 1973.

Kerlinger, F.N., & Rokeach, M. The factorial structure of the F and D Scales. Journal of Personality and Social Psychology, 1966, 4, 391-399.

King, R.J. Personality and behavioral correlates of the conceptual level matching model with vocational secondary school students. Dissertation Abstracts International, 1974, 37, 2785B.

Koenig, K., & McKeachie, W.J. Personality and independent study. Journal of Educational Psychology, 1959, 50, 132-134.

Koffka, K. Principles of gestalt psychology. New York: Harcourt, Brace, & World, 1935.

Lefcourt, H.M. Internal versus external control of reinforcement: A review. Psychological Bulletin, 1966, 65, 206-220.

Levitt, E.E. The psychology of anxiety. Indianapolis: Bobbs-Merrill, 1967.

Lewin, K. Principles of topological psychology. New York: McGraw-Hill, 1936.

Lewin, K. Field theory in social science. New York: Harper, 1951. Cited in L.A. Pervin, Performance and satisfaction as a function of individual-environment fit. Psychological Bulletin, 1968, 69, 56-68.

Lewin, K., Lippitt, R., & White, R. Patterns of aggressive behavior in experimentally created "social climates". Journal of Social Psychology, 1939, 10, 271-290.

Lorge, I., Thorndike, R.L., & Hagen, E. Canadian Lorge-Thorndike Intelligence Tests. Toronto: Thomas Nelson & Son, 1967.

Lubin, A. The interpretation of significant interaction. Educational and Psychological Measurement, 1961, 21, 807-817.

Lykken, D.T. Statistical significance in psychological research. Psychological Bulletin, 1968, 70, 151-159.

Lynn, R., & Gordon, I. The relation of neuroticism and extraversion to intelligence and educational attainment. British Journal of Educational Psychology, 1961, 31, 194-203.

Magnusson, D. The individual in the situation. Studia

Psychologica, 1974, 16, 124-132.

Magnusson, D., & Endler, N.S. Interactional psychology: Present status and future prospects. In D. Magnusson and N.S. Endler (Eds.), Personality at the crossroads. Hillsdale, New Jersey: Lawrence Erlbaum, 1977.

Maney, A.C. The authoritatianism dimension in student evaluations of faculty. Journal of Educational Sociology, 1959, 32, 226-231.

Mann, R.D. The college classroom. New York: John Wiley & Sons, 1969. Cited in N. DiMarco, Life style, learning structure, consequence, and social attitudes. American Educational Research Journal, 1974, 11, 203-209.

McCann, S.J.H. The problem of overlapping interactions in attribute x treatment interaction (ATI) research. Paper presented at the meeting of the Canadian Society for the Study of Education, Halifax, Nova Scotia, June 1981.

McCann, S.J.H., & Fisher, R.J. The interactive relationships of teacher directiveness and student authoritarianism and dogmatism to grades and satisfaction. Alberta Journal of Educational Research, 1977, 23, 71-84.

McCann, S.J.H., & Hamilton, M.L. The interaction of student satisfaction, dogmatism, and the structure dimension of teacher directiveness. Psychology in the Schools, 1978, 15, 302-309.

McCann, S.J.H., & Short, R.H. Methodological and conceptual problems and issues in attribute x treatment interaction (ATI) research. Canadian Journal of Education, 1982, 7, 101-117.

McCann, S.J.H., & Stewin, L.L. Perceived" versus "actual" treatments in attribute x treatment interaction (ATI) research. Paper presented at the meeting of the Canadian Society for the Study of Education, Montreal, Quebec, June 1980.

McGee, H.M. Measurement of authoritarianism and its relation to teacher's classroom behavior. Genetic Psychology Monographs, 1955, 52, 89-146.

McKeachie, W.J. Anxiety in the college classroom. Journal of Educational Research, 1951, 45, 153-160.

McKeachie, W.J. Student centered versus teacher centered instruction. Journal of Educational Psychology, 1954, 45, 143-150.

McKeachie, W.J. Motivation, teaching methods, and college learning. In M.R. Jones (Ed.), Nebraska symposium on motivation. Lincoln, Nebraska: University of Nebraska, 1961.

McKeachie, W.J., Milholland, J.E., Mann, R., & Isaacson, R.L. Research on the characteristics of effective teaching. Unpublished report, University of Michigan, 1968. Cited in L.J. Cronbach and R.E. Snow, Aptitudes and instructional methods. New York: Irvington, 1977.

McLachlan, J.F.C. Individual differences and teaching methods in student interpretation of modern art. Unpublished master's thesis, University of Toronto, 1969. Cited in D.E. Hunt, Matching models in education. Toronto: Ontario Institute for Studies in Education, 1971.

Megargee, E.I. The California Psychological Inventory handbook. San Francisco: Josey-Bass, 1972.

Mirels, H.L. Dimensions of internal versus external control. Journal of Consulting and Clinical Psychology, 1970, 34, 226-228.

Mischel, W. Toward a cognitive social learning reconceptualization of personality. Psychological Review, 1973, 80, 252-283.

Murray, H.A. Explorations in personality. London: Oxford University Press, 1938.

Myers, J.L. Fundamentals of experimental design (3rd ed.). Toronto: Allyn & Bacon, 1979.

Navran, L. A rationally derived MMPI Scale to measure dependence. Journal of Consulting Psychology, 1954, 18, 192.

Newsom, R.S., Eichens, R., & Looft, W.R. Intrinsic individual differences: A basis for enhancing instructional programs. Journal of Educational Research, 1972, 65, 387-392.

Nie, N.H., Hull, G.H., Jenkins, J.G., Steinbrenner, K., & Bent, D.H. Statistical package for the social sciences (SPSS) (2nd ed.). New York: McGraw-Hill, 1975.

Noy, J.E., & Hunt, D.E. Student-directed learning from biographical information systems. Canadian Journal of Behavioral Science, 1972, 4, 54-63. Cited in D.E. Hunt, L.F. Butler, J.E. Noy, and M.E. Rosser, Assessing conceptual level by the paragraph completion method. Toronto: Ontario Institute for Studies in Education, 1978.

Olander, H.T., & Robertson, H.C. The effectiveness of discovery and expository methods in the teaching of fourth-grade mathematics. Journal for Research in Mathematics Education, 1973, 4, 33-44.

Ollendick, D.G., & Ollendick, T.H. The interrelationship of measures of locus of control, intelligence and achievement in juvenile delinquents. Educational and Psychological Measurement, 1976, 36, 1111-1113.

Otis, A.S., & Lennon, R.T. Otis-Lennon Mental Ability Tests. New York: Harcourt, Brace, & World, 1969.

Parent, J., Forward, J., Canter, R., & Mohling, J. Interactive effects of teaching strategy and personal locus of control on student performance and satisfaction. Journal of Educational Psychology, 1975, 67, 764-769.

Pascal, C.E. Individual differences and preference for instructional method. Canadian Journal of Behavioral Science, 1973, 5, 272-279.

Patton, J.A. A study of the effects of student acceptance of responsibility and motivation on course behavior. Unpublished doctoral dissertation, University of Michigan, 1955. Cited in W.J. McKeachie, Students, groups, and teaching methods. American Psychologist, 1958, 13, 580-584.

Patton, J.F., & Freitag, C.B. Correlational study of death

anxiety, general anxiety, and locus of control. Psychological Reports, 1977, 40, 51-54.

Pervin, L.A. Performance and satisfaction as a function of individual-environment fit. Psychological Bulletin, 1968, 69, 56-68.

Peterson, P.L. Interactive effects of student anxiety, achievement orientation, and teacher behavior on student achievement and attitude. Unpublished doctoral dissertation, Stanford University, 1976. Cited in R.E. Snow, Research on aptitude for learning: A progress report. Review of Research in Education, 1976, 4, 50-105.

Peterson, P.L. Interactive effects of student anxiety, achievement orientation, and teacher behavior on student achievement and attitude. Journal of Educational Psychology, 1977, 69, 779-792.

Peterson, P.L. Aptitude x treatment interaction effects of teacher structuring and student participation in college instruction. Journal of Educational Psychology, 1979, 71, 521-533.

Plant, W.T. Rokeach's Dogmatism Scale as a measure of general authoritarianism. Psychological Reports, 1966, 6, 164.

Porteus, A. Teacher-centered vs. student-centered instruction: Interactions with cognitive and motivational aptitudes. Unpublished doctoral dissertation, Stanford University, 1976. Cited in R.E. Snow, Research on aptitude for learning: A progress report. Review of Research in Education, 1976, 4, 50-105.

Ragsdale, R.G. Empirically based myths: Astrology, biorhythms, and ATIs. Canadian Journal of Education, 1980, 5, 40-51.

Raney, J.F. A plea and a plan for replication. American Psychologist, 1970, 25, 1176-1177.

Raphael, D. An investigation into aspects of identity status of high school females. Unpublished doctoral dissertation, University of Toronto, 1975. Cited in D.E. Hunt, L.F.

Butler, J.E. Noy, and M.E. Rosser, Assessing conceptual level by the paragraph completion method. Toronto: Ontario Institute for Studies in Education, 1978.

Raven, J.C. Guide to the Standard Progressive Matrices: Sets A, B, C, D, and E. London: H.K. Lewis, 1956.

Reid, D.W., & Ware, E.E. Multidimensionality of internal-external control: Implications for past and future research. Canadian Journal of Behavioral Science, 1973, 5, 264-271.

Remmers, H.H. Rating methods in research and teaching. In N.L. Gage (Ed.), Handbook of research on teaching. Chicago: Rand McNally, 1963.

Rhetts, J.E. Aptitude-treatment interactions in individualized instruction: A conceptual framework and example from the PLAN. In L. Sperry (Ed.), Learning, performance and individual differences: Essays and readings. Glenview, Illinois: Scott, Foresman, 1972.

Rich, H.L., & Bush, A.J. An investigation of the joint influence of faculty control and student locus of reinforcement on instructional evaluation. Journal of Educational Research, 1978, 71, 194-197.

Rizzuto, M. Experimental comparison of inductive and deductive methods of teaching concepts of language structure. Journal of Educational Research, 1970, 63, 269-273.

Robertson, L. Matching instuctional method to student learning style in art interpretation: A replication. Unpublished master's thesis, University of Toronto, 1973. Cited in J.F.C. McLachlan and D.E. Hunt, Differential effects of discovery learning as a function of student conceptual level. Canadian Journal of Behavioral Science, 1973, 5, 152-160.

Rogers, R., & Wright, W. Behavioral rigidity and its relationship to authoritarianism and obsessive-compulsiveness. Perceptual and Motor Skills, 1975, 40, 802.

Rokeach, M. The open and closed mind. New York: Basic Books, 1960.

Rotter, J.B. Social learning and clinical psychology. New York: Prentice-Hall, 1954.

Rotter, J.B. Generalized expectancies of internal versus external control of reinforcement. Psychological Monographs, 1966, 80, 1-28.

Rotter, J.B., Seeman, M., & Liverant, S. Internal versus external control of reinforcements: A major variable in behavior therapy. In N.F. Washburne (Ed.), Decisions, values and groups, Vol 2. London: Pergamon Press, 1962.

Rouff, L.L. Openness. creativity, and complexity. Psychological Reports, 1975, 37, 1009-1010.

Runkel, P.J., & McGrath, J.E. Research on human behavior. New York: Holt, Rinehart and Winston, 1972.

Salomon, G. Heuristic models for the generation of aptitude-treatment interaction hypotheses. Review of Educational Research, 1972, 42, 327-343.

Sanders, J.J. Interactive effects ot two methods of college instruction and locus of control on student performance and satisfaction. Dissertation Abstracts International, 1978, 38, 6627A-6628A.

Sarason, S.B., Hill, K.T., & Zimbardo, P.G. A longitudinal study of the relation of test anxiety to performance on intelligence and achievement level. Monograph of Social Research and Child Development, 1964, 29, No. 7 (Serial No. 98). Cited in M.A. Wallach & N. Kogan, Modes of thinking in young children. New York: Holt, Rinehart and Winston, 1965.

Schalling, D. The trait-situation interaction and the physiological correlates of behavior. In D. Magnusson and N.S. Endler (Eds.), Personality at the crossroads. Hillsdale, New Jersey: Lawrence Erlbaum, 1977.

Schantz, B.M.B. An experimental study comparing the effects of verbal recall by children in direct and indirect

teaching methods as a tool of measurement. Dissertation Abstracts International, 1964, 25, 1054.

Schroder, H.M., Driver, M.J., & Streufert, S. Human information processing. New York: Holt, Rinehart and Winston, 1967.

Schultz, R.A. Student importance ratings as an indicator of the structure of actual and ideal sociophysical climates. Journal of Educational Psychology, 1979, 71, 827-839.

Sells, S.B. Dimensions of stimulus situations which account for behavior variance. In S.B. Sells (Ed.), Stimulus determinants of behavior. New York: Ronald Press, 1963. (a)

Sells, S.B. An interactionist looks at the environment. American Psychologist, 1963, 18, 696-702. (b)

Selltiz, C., Jahoda, M., Deutsch, M., & Cook, S. W. Research methods in social relations. New York: Holt, Rinehart, and Winston, 1959.

Shaver, J.P. The productivity of educational research and the applied-basic research distinction. Educational Researcher, 1979, 8, 3-9.

Shaw, M.E. & Costanzo, P.R. Theories of social psychology. New York: McGraw-Hill, 1970.

Short, R.H., & McCann, S.J.H. Attribute-treatment interactions and the matching model: Issues and problems. Paper presented at the meeting of the Canadian Society for the Study of Education, Saskatoon, Saskatchewan, June 1979.

Skolnik, A. Motivational imagery and behavior over twenty years. Journal of Consulting Psychology, 1966, 30, 463-478.

Smith, D.E.P., Wood, R.L., Downer, J.W., & Raygor, A.L. Reading improvement as a function of student personality and teaching method. Journal of Educational Psychology, 1956, 47, 47-59.

Smith, N.C. Replication studies: A neglected aspect of

psychological research. American Psychologist, 1970, 25, 970-975.

Snow, R.E. Research on aptitude for learning: A progress report. In L.S. Shulman (Ed.), Review of research in education, 1976, 4, 50-105.

Spielberger, C.D. Theory and research on anxiety. In C.D. Speilberger (Ed.), Anxiety and behavior. New York: Academic Press, 1966.

Spielberger, C.D., Gorsuch, R.L., & Lushene, R. Manual for the State-Trait Anxiety Inventory (STAI). Palo Alto, California: Consulting Psychologists Press, 1970.

Thompson, R.C., & Michel, J.B. Measuring authoritarianism: A comparison of the F and D scales. Journal of Personality, 1972, 40, 180-190.

Troldahl, V.C., & Powell, F.A. A short-form dogmatism scale for use in field studies. Social Forces, 1965, 44, 211-225.

Tuckman, B.W. A study of the effectiveness of directive versus nondirective vocational teachers as a function of student characteristics and course format. United States Office of Education Research Project No. 6-2300, Rutgers University, 1968.

Vaachiano, R.B., Strauss, P.S., & Hochman, L. The open and closed mind: A review of dogmatism. Psychological Bulletin, 1969, 71, 261-273.

Vaachiano, R.B., Strauss, P.S., & Schiffman, D.C. Personality correlates of dogmatism. Journal of Consulting and Clinical Psychology, 1968, 32, 83-85.

Vale, J.R., & Vale, C.A. Individual differences and general laws in psychology: A reconciliation. American Psychologist, 1969, 24, 1093-1108.

Vidler, D.C. The relationship between convergent and divergent thinking, test-anxiety, and curiosity. Dissertation Abstracts International, 1972, 33, 2798B.

Vinson, A.W. An investigation concerning personality characteristics, classroom climate and academic achievement. Journal of Negro Education, 1977, 46, 334-343.

Wallach, M.A, & Kogan, N. Modes of thinking in young children. New York: Holt, Rinehart and Winston, 1965.

Wallberg, H.J. Psychology of learning environments: Behavioral, structural, or perceptual? In L.S. Shulman (Ed.), Review of research in education (Vol. 4). Itasca, Illinois: Peacock, 1976.

Wallen, N.E., & Wodtke, K.H. Relationship between teacher characteristics and student behavior. Part I. Unpublished report, University of Utah, 1963. Cited in L.J. Cronbach and R.E.Snow, Aptitudes and instructional methods, New York: Irvington, 1977.

Ward, J.N. Group-study versus lecture-demonstration method in physical science instruction for general education college students. Journal of Experimental Education, 1956, 24, 197-210.

Weiss, R.L., Sales, S.M., & Bode, S. Student authoritarianism and teacher authoritarianism as factors in determination of student performance and attitudes. Journal of Experimental Education, 1970, 38, 83-87.

West, L.H.T., & Theobald, J.H. ATI with a large set of nonorthogonal attribute variables: A multiple regression solution. Paper presented at the meeting of the American Educational Research Association, Los Angeles, California, April 1981.

Wispe, L.G. Evaluating section teaching methods in the introductory course. Journal of Educational Research, 1951, 45, 161-186.

Wittrock, M.C. The cognitive movement in instruction. Educational Researcher, 1979, 8, 5-11.

Ycas, M., & Pascal, C. Convergent, divergent, and esthetic ability and bias in college students: Their relation to personality and preference for major subject and instructional method. Paper presented at the annual meeting

of the American Educational Research Association, 1973. Cited in J.E. Brophy and T.L. Good, Teacher-student relationships: Courses and consequences. New York: Holt, Rinehart and Winston, 1974.

Zagona, S.V., & Zurcher, L.A. The relationship of verbal ability and other cognitive variables to the open-closed cognitive dimension. Journal of Psychology, 1965, 60, 213-219.

Zampogna, J., Gentile, R.J., Papalia, A., & Silber, G.R. Relationships between learning styles and learning environments in selected modern language classes. Modern Language Journal, 1976, 60, 443-447.

Zuckerman, M., & Gerbasi, K.C. The relationship between four factors of Rotter's I-E scale and other personality and attitudinal measures. Catalog of Selected Documents in Psychology, 1975, 5, 191.

Zussman, D. Convergent-divergent thinking of students and their teachers: A between class analysis. Paper presented at the meeting of the Canadian Psychological Association, Toronto, Ontario, June 1976.

Zussman, D., & Pascal, C. The interaction of divergence and convergence of students and teachers with personality and instructional variables affecting educational outcomes. Paper presented at the meeting of the American Educational Research Association, 1973. Cited in J.E. Brophy & T.L. Good, Teacher-student relationships: Causes and consequences. New York: Holt, Rinehart and Winston, 1974.

Appendix A

Student Satisfaction Scale (SSS)

The following items pertain directly to your experience in your English class this year. The best answer to each item is your personal opinion based on your personal experience.

Select 1, 2, 3, 4, 5, 6, 7, 8, or 9 depending on how you feel in each case. For example, consider the following sample item.

I feel like skipping this class

1 2 3 4 5 6 7 8 9

more often than my other classes.

less often than my other classes.

Select the number which would indicate the degree to which your feelings are like the statement on the left or the statement on the right. For example, if you selected 6 that would mean that the statement on the right is a little like your feelings; if you selected 9 that would mean that the statement on the right is very very much like your feelings. On the other hand, if you selected 4 that would mean that the statement on the left is a little like your feelings; if you selected 1 that would mean that the statement on the left is very very much like your feelings, and so on. That is, the numbers 1, 2, 3, 4, 5, 6, 7, 8, and 9 are on a continuum from one extreme to the other extreme.

Select only one number for each of the 10 items.

Please answer every one of the 10 items.

Be sure to put your answers on the computer answer sheet labelled "I".

1. I am very

1 2 3 4 5 6 7 8 9

unsatisfied with this teacher. — satisfied with this teacher.

2. I would be very satisfied if my other courses were

1 2 3 4 5 6 7 8 9

less like this course. — more like this course.

3. I like this teacher much

1 2 3 4 5 6 7 8 9

less than most other teachers I have had or have now. — more than mostother teachers I have had or have now.

4. I would be very satisfied if my other teachers were

1 2 3 4 5 6 7 8 9

less like this teacher. — more like this teacher.

5. My feelings toward this course are

1 2 3 4 5 6 7 8 9

very unfavourable. — very favourable.

6. My feelings toward this teacher are

1 2 3 4 5 6 7 8 9

very unfavourable. — very favourable.

7. I am very

1 2 3 4 5 6 7 8 9

unsatisfied with this course. — satisfied with this course.

8. I

1 2 3 4 5 6 7 8 9

dislike this teacher. — like this teacher.

9. I

1 2 3 4 5 6 7 8 9

dislike this course. — like this course.

10. I like this course much

1 2 3 4 5 6 7 8 9

less than most other courses I have had or have now. — more than most other courses I have had or have now.